Fossil Energy as a Weapon

Environmental Security, Resource Dependence and the Role of Fossil Fuels in Armed Conflict

WHITE PAPER

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Disclaimer

This White Paper is prepared as an independent policy and research document. It is intended to support discussion among policymakers, parliamentary audiences, energy-security specialists, defence and foreign-policy communities, environmental experts, civil society organisations and researchers.

The analysis is based on publicly available sources, including official documents, institutional data, academic literature, policy research and open-source reporting. The paper does not claim that fossil fuels are the sole cause of armed conflict. Its argument is that fossil fuel dependence creates recurring pathways of strategic vulnerability, including coercion, conflict finance, infrastructure exposure, price instability and environmental harm.

The views expressed in this paper are those of the authors and do not represent the official position of any government, international organisation or institution unless explicitly stated.

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Any errors, omissions or interpretations remain the responsibility of the authors.

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Abbreviations and Acronyms

ACER — European Union Agency for the Cooperation of Energy Regulators
Bcf/d — Billion cubic feet per day
CAGR — Compound annual growth rate
CBAM — Carbon Border Adjustment Mechanism
CCS — Carbon capture and storage
CCUS — Carbon capture, utilisation and storage
CFSP — Common Foreign and Security Policy
CO_2 — Carbon dioxide
CO_2-eq — Carbon dioxide equivalent
CREA — Centre for Research on Energy and Clean Air
CRM — Critical raw material
CRMA — Critical Raw Materials Act
ECA — European Court of Auditors
ECB — European Central Bank
EIA — U.S. Energy Information Administration
EIB — European Investment Bank
EITI — Extractive Industries Transparency Initiative
ENISA — European Union Agency for Cybersecurity
ENTSO-E — European Network of Transmission System Operators for Electricity
EU — European Union
EU ETS — European Union Emissions Trading System
FATF — Financial Action Task Force
FDI — Foreign direct investment
GDP — Gross domestic product
G7 — Group of Seven
GHG — Greenhouse gas
GW — Gigawatt
IEA — International Energy Agency
ICRC — International Committee of the Red Cross
IFI — International financial institution
IMF — International Monetary Fund
IMO — International Maritime Organization
IPCC — Intergovernmental Panel on Climate Change
IRENA — International Renewable Energy Agency
ISIS / ISIL — Islamic State of Iraq and Syria / Islamic State of Iraq and the Levant
JRC — Joint Research Centre of the European Commission
LNG — Liquefied natural gas
Mb/d — Million barrels per day
MEP — Member of the European Parliament
NATO — North Atlantic Treaty Organisation
NDC — Nationally determined contribution
NGO — Non-governmental organisation
OECD — Organisation for Economic Co-operation and Development
OPEC — Organization of the Petroleum Exporting Countries

OPEC+ — OPEC and associated non-OPEC oil-producing states
OSINT — Open-source intelligence
PV — Photovoltaic
REPowerEU — EU plan to reduce dependence on Russian fossil fuels and accelerate the clean-energy transition
SIPRI — Stockholm International Peace Research Institute
SUMED — Suez-Mediterranean crude oil pipeline
TFEU — Treaty on the Functioning of the European Union
TSO — Transmission system operator
UN — United Nations
UNCC — United Nations Compensation Commission
UNCTAD — United Nations Conference on Trade and Development
UNEP — United Nations Environment Programme
UNFCCC — United Nations Framework Convention on Climate Change
USGS — United States Geological Survey
USD — United States dollar
WTO — World Trade Organization

Methodological note

This White Paper uses comparative policy analysis, historical review, case-study assessment and review of publicly available institutional, academic and policy sources. It does not argue that fossil fuels are the sole cause of armed conflict. It examines how fossil fuel dependence can create or intensify specific security risks, including coercion, conflict finance, infrastructure exposure, price instability and environmental damage. A fuller methodology is provided in Annex I.

Executive Summary

This White Paper examines fossil fuel dependence as a strategic security vulnerability. It argues that oil, gas and coal should not be treated solely as energy commodities or as environmental concerns. They also shape coercive power, conflict finance, infrastructure exposure, economic resilience and environmental security.

The paper does not claim that fossil fuels are the sole cause of armed conflict. Such a claim would be historically inaccurate and analytically weak. Its argument is narrower and more defensible: fossil fuel systems create recurring pathways through which insecurity can be financed, amplified, transmitted or prolonged. These pathways include supply coercion, hydrocarbon revenue used for military or coercive purposes, vulnerable infrastructure and chokepoints, price shocks, environmental damage and reduced strategic autonomy for import-dependent states.

Fossil fuels have distinctive security characteristics. They are geographically concentrated, capital-intensive, infrastructure-dependent and essential to modern economies. States that control production, pipelines, ports, storage, pricing or maritime routes can acquire leverage over others. Governments with large hydrocarbon revenues may use them to support military expenditure, internal security structures, patronage networks or external proxy activity. Armed groups that capture oilfields, fuel depots, refineries or smuggling routes can turn them into revenue. Import-dependent economies, meanwhile, can be exposed to supply interruption, price volatility and pressure from suppliers whose political objectives may be hostile or unstable.

Europe’s experience since Russia’s full-scale invasion of Ukraine in February 2022 provides the immediate policy context. Before the war, Russian fossil fuels were deeply embedded in the European energy system. Russian gas was widely treated as a commercial supply issue, supported by long-term contracts, pipeline infrastructure and assumptions of mutual interdependence. The crisis exposed the strategic weakness of that assumption. Russia’s manipulation of gas supplies, the surge in energy prices, Europe’s emergency search for alternative imports and the subsequent policy response demonstrated that fossil fuel dependence can constrain political autonomy, impose economic costs and test alliance cohesion.

The European Union has reduced Russian fossil fuel dependence substantially. Russian coal has been banned, Russian oil imports have been restricted through sanctions, embargoes and price-cap measures, and Russian gas imports have fallen sharply. REPowerEU has strengthened the link between energy security, demand reduction and clean-energy deployment. Yet Europe’s structural exposure has not disappeared. The EU remains a major energy importer. Oil continues to dominate transport. LNG diversification has reduced dependence on Russian pipeline gas but increased exposure to global gas markets, maritime routes, shipping capacity and new supplier relationships. Fossil fuel price shocks still affect inflation, industrial competitiveness, public finances and household costs.

The strategic lesson is therefore broader than Russia. The problem is not only dependence on one hostile supplier. It is the structure of fossil fuel dependence itself. Fossil fuel systems rely on continuous fuel flows, fixed infrastructure, centralised processing, vulnerable routes, long-distance transport and politically exposed supplier relationships. These characteristics make them susceptible to coercion, disruption, market manipulation and conflict-related damage.

The White Paper identifies five principal security pathways.

Fossil fuels can be used as instruments of coercion. Energy weaponisation may take the form of supply cuts, threatened disruption, price manipulation, politically conditioned contracts, infrastructure ownership, storage pressure or maritime-route threats. The 1973–74 oil embargo remains a historical reference point, while Russia's use of gas against Europe is the clearest contemporary European case. Threats around the Strait of Hormuz, attacks affecting Red Sea shipping, and pipeline politics in the South Caucasus and Central Asia show that coercion may operate through routes and infrastructure as well as through suppliers.

Fossil fuels can also finance war, repression and proxy activity. Hydrocarbon exports provide revenue, foreign exchange and fiscal resilience. These resources can sustain military expenditure, sanctions evasion, internal security systems, proxy networks and patronage structures. Russia's fossil fuel exports during the war against Ukraine, ISIS oil smuggling in Iraq and Syria, militia competition over Libya's oil infrastructure, South Sudan's oil-linked fiscal vulnerability and Iran's sanctioned oil economy illustrate different forms of this pattern. Fossil fuels may not start these conflicts, but they can enable actors to continue them.

A further pathway lies in concentrated infrastructure risk. Oil and LNG move through chokepoints such as the Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits and the Strait of Malacca. Pipelines, LNG terminals, refineries, ports, storage facilities and undersea infrastructure are exposed to sabotage, drones, mines, cyberattacks, accidents and hybrid operations. A local disruption can have wider effects through prices, insurance costs, shipping delays, industrial supply chains and market expectations.

Fossil fuel-related environmental damage can also multiply instability. Oil spills, gas flaring, methane leakage, refinery damage, coal pollution, scorched-earth tactics and attacks on energy infrastructure can contaminate land, water and air, damage livelihoods, weaken public health and increase reconstruction costs. Kuwait's burning oil wells in 1991, Iraq's oil-related contamination, the Niger Delta's long-term extraction-related insecurity and Russia's attacks on Ukraine's energy infrastructure show that fossil fuel damage is both an environmental and a security issue.

Finally, fossil fuel dependence can weaken the strategic autonomy of importers. States dependent on imported oil and gas may be more exposed to coercion, less willing to impose sanctions, more vulnerable to inflationary shocks and less able to sustain foreign-policy decisions under pressure. Energy insecurity can also be exploited through disinformation, political influence and public anxiety.

The paper also recognises the limits of its argument. Fossil fuels do not automatically cause war. Resource wealth does not always produce authoritarianism. Renewable energy does not eliminate geopolitical risk. Clean-energy systems depend on critical minerals, grids, storage, manufacturing capacity, digital systems, permitting and public consent. China's position in clean-technology supply chains, the concentration of critical mineral refining, grid vulnerability and battery-material constraints all show that the energy transition has its own strategic risks.

The conclusion is therefore comparative, not utopian. A renewable, electrified and efficient energy system is not risk-free. However, if designed with resilience in mind, it can reduce several vulnerabilities associated with fossil fuels: continuous dependence on imported fuel, exposure to oil and gas chokepoints, pipeline coercion, hydrocarbon rent-financed aggression, fossil price shocks and environmentally destructive extraction. Critical minerals can be recycled, substituted, stockpiled and diversified over time. Oil and gas, once burned, must be replaced continuously. That difference has long-term security implications.

This White Paper frames energy transition as a security transition. The purpose is not only to reduce emissions. It is to reduce the strategic power of actors able to turn oil, gas and coal into tools of coercion, conflict finance and geopolitical leverage. Efficiency, electrification, renewable generation, storage, interconnectors, resilient grids and demand reduction should therefore be understood as security measures. The same applies to sanctions enforcement, critical minerals strategy, undersea infrastructure monitoring, producer-country diversification and environmental remediation after conflict.

The policy implications are direct. The EU, NATO and Member States should formally treat fossil fuel dependence as a strategic vulnerability. Energy transition should be integrated into defence planning, foreign policy, sanctions policy, industrial strategy, enlargement policy and development finance. Europe should reduce demand for imported fossil fuels through energy efficiency, heat pumps, industrial electrification, transport electrification, public transport and flexible demand. Renewable deployment must be accelerated alongside grids, storage, interconnectors and cyber resilience.

Critical infrastructure protection should cover both legacy fossil assets and emerging low-carbon systems. Pipelines, LNG terminals, refineries, ports, grids, offshore wind farms, electricity interconnectors, battery storage and undersea cables are all part of the strategic environment. EU-NATO co-operation should be strengthened on maritime security, hybrid threats, critical infrastructure protection, cyber resilience, exercises, intelligence sharing and crisis response.

Sanctions policy should continue to target fossil fuel revenues that finance aggression, while closing loopholes involving shadow fleets, ship-to-ship transfers, opaque insurance, third-country refining and re-export channels. Europe should also avoid replacing Russian fossil fuel dependence with new strategic dependencies on narrow groups of LNG suppliers, critical mineral processors, clean-technology manufacturers or digital grid providers.

A European critical minerals security strategy should combine diversified sourcing, domestic and allied processing, recycling, substitution, strategic reserves and environmental safeguards. At the same time, the EU should support fossil fuel-exporting partner countries in economic diversification. A disorderly decline in hydrocarbon revenues could destabilise fragile producer states, intensify elite competition and weaken public finances. Transition finance, public-finance reform, methane reduction, renewable deployment and transparent resource governance should therefore form part of Europe's external security policy.

The central policy message is that Europe should not respond to fossil fuel coercion only by finding different fossil fuel suppliers. Supplier diversification is necessary during transition, but it is not sufficient. The deeper task is to reduce the strategic weight of oil, gas and coal in the European economy. The less Europe depends on fossil fuels, the less exposed it is to energy blackmail, fossil-funded aggression, infrastructure sabotage, maritime chokepoints, price shocks and environmental damage.

Energy transition should therefore be understood as part of Europe's wider move from dependence to resilience. It is not only a climate obligation or a technological modernisation project. It is a practical means of reducing the capacity of states and armed groups to use fossil fuels as instruments of war, coercion and instability.

Chapter 1

Introduction: Fossil Fuels as a Security Problem

1.1 Purpose of the White Paper

This White Paper examines fossil fuel dependence as a strategic security problem. Its purpose is to analyse how reliance on oil, gas and coal contributes to conflict risk, coercive leverage, war financing, infrastructure vulnerability and environmental harm. It argues that fossil fuels should not be treated only as energy commodities or as a climate-policy concern. They should also be assessed as strategic assets capable of shaping the behaviour of states, armed groups, markets and alliances.[1]

The central proposition is deliberately precise. Fossil fuels do not automatically cause war. Armed conflict usually results from a combination of political, territorial, economic, ideological, institutional and military factors. It would therefore be inaccurate to present oil, gas or coal as the single cause of modern conflict. The more defensible argument is that fossil fuel systems repeatedly create identifiable pathways of insecurity. They provide revenues that can finance military spending and repression; they allow supplier states to exert pressure on importers; they concentrate global energy flows through narrow routes and vulnerable infrastructure; and they generate environmental damage that can deepen fragility before, during and after conflict.[2]

The European Union's experience since Russia's full-scale invasion of Ukraine in February 2022 provides the immediate policy context. The European Commission's REPowerEU strategy was developed in direct response to Russia's invasion of Ukraine, the disruption of global energy markets and the need to phase out Russian fossil fuel imports.[3] The Commission has also described the European response as a way to counter the weaponisation of energy supplies and to weaken Russia's ability to use energy revenues and energy dependence as instruments of pressure.[4] Current EU policy and legislative reporting record that Russia's share of EU gas imports fell from about 45 per cent before the full-scale invasion to around 12 per cent by late 2025, while Russian coal imports have been banned and Russian oil imports have fallen sharply under sanctions and diversification measures.[5]

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[1] Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991); Daniel Yergin, The Quest: Energy, Security, and the Remaking of the Modern World (New York: Penguin Press, 2011).

[2] Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005); Michael L. Ross, The Oil Curse: How Petroleum Wealth Shapes the Development of Nations (Princeton: Princeton University Press, 2012).

[3] European Commission, 'REPowerEU: Affordable, Secure and Sustainable Energy for Europe', European Commission, accessed 4 June 2026.

[4] European Commission, 'REPowerEU: Affordable, Secure and Sustainable Energy for Europe', European Commission, accessed 4 June 2026; European Commission, REPowerEU Plan, COM(2022) 230 final, Brussels, 18 May 2022.

[5] European Commission, Roadmap towards Ending Russian Energy Imports, Brussels, 6 May 2025; European Parliament, Legislative Resolution of 17 December 2025 on the Proposal for a Regulation on Phasing Out Russian Natural Gas Imports, Improving Monitoring of Potential Energy Dependencies and Amending Regulation (EU) 2017/1938, COM(2025)0828, C10-0123/2025, 2025/0180(COD), Brussels, 17 December 2025.

The White Paper therefore proposes a wider framework. Energy transition should be understood not only as a route to lower emissions, but also as a security transition. Reducing fossil fuel dependence can reduce exposure to authoritarian rentier states, coercive supply politics, maritime chokepoints, pipeline dependency, sanctions evasion and fossil-funded aggression. This does not mean that renewable energy systems are free of risk. They create their own dependencies, particularly in relation to critical minerals, grid infrastructure, storage, manufacturing capacity and cyber security. The argument is comparative: a resilient, diversified, electrified and renewable energy system can reduce specific vulnerabilities associated with oil, gas and coal, provided it is designed with security in mind.[6]

The purpose of this White Paper is therefore threefold. First, it sets out an analytical framework for understanding fossil fuel dependence as a security problem. Secondly, it examines historical and contemporary cases in which fossil fuels have shaped conflict, coercion and strategic exposure. Thirdly, it proposes policy measures for the EU, NATO and partner states to integrate energy transition, environmental protection, infrastructure resilience and security planning.[7]

1.2 Why fossil fuel dependence is a security issue

Fossil fuel dependence is a security issue because oil, gas and coal are not ordinary commodities. They are essential inputs into transport, electricity generation, heating, industrial production, military logistics, agriculture and global trade. When supply is disrupted or prices rise sharply, the consequences extend across society. They can affect household costs, industrial competitiveness, fiscal stability, public order, military mobility and diplomatic strategy.[8]

The International Energy Agency defines energy security as reliable and affordable access to energy, with its contemporary work covering oil security, gas security, electricity security, clean-energy supply chains, cyber risks, critical minerals and the wider resilience of energy systems.[9] This definition is useful because it combines physical supply, affordability and continuity. Energy insecurity may arise from an actual shortage, but it may also arise from the threat of disruption, sudden price volatility, limited substitution options or dependence on a supplier with hostile or incompatible strategic objectives.

Fossil fuels generate particular security risks because of four structural characteristics:

1. They are geographically concentrated. Oil and gas reserves are not evenly distributed. Some states possess large reserves and export capacity; others are structurally dependent on imports. This creates asymmetry. A producer, exporter or transit state may acquire

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[6] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[7] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

[8] International Energy Agency, *Energy Security*; U.S. Energy Information Administration, *World Oil Transit Chokepoints*, Washington, DC, 2025.

[9] International Energy Agency, *Energy Security*.

leverage over importers that cannot rapidly replace supply. In a benign market environment, such interdependence may be commercially manageable. In a crisis, it may become coercive.[10]

2. Fossil fuels depend on fixed and vulnerable infrastructure. Pipelines, refineries, ports, LNG terminals, storage facilities, offshore platforms, compressor stations and electricity grids require high capital investment and long planning horizons. They cannot be replaced quickly. A pipeline system locks producers, transit states and importers into a particular geography. LNG provides more flexibility than pipeline gas, but it remains dependent on terminals, shipping capacity and global price competition.[11]

3. Fossil fuel trade relies on maritime chokepoints. Oil and LNG move through narrow passages such as the Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits and the Strait of Malacca. A disruption in one location can have wider consequences through rerouting costs, insurance premiums, price expectations, shipping delays and market panic. The U.S. Energy Information Administration treats major maritime passages, including the Strait of Hormuz, as critical energy chokepoints because of the volume of oil and LNG that passes through them.[12]

4. Fossil fuel revenues can be converted into political and military power. Hydrocarbon exports provide foreign exchange, budget revenue and discretionary funds. In some states, such revenues strengthen patronage networks, internal security services and military expenditure. In non-state conflicts, control over oilfields, refineries, smuggling routes or fuel distribution can provide armed groups with income. The Financial Action Task Force's work on ISIS financing documented how captured oil assets and illicit trade became a material source of terrorist and armed-group finance.[13]

These characteristics make fossil fuels central to security policy. A state that depends heavily on imported fossil fuels may be vulnerable to supply interruption, coercive pricing, contract manipulation or diplomatic pressure. A producer state that depends heavily on fossil revenue may be vulnerable to price collapse, sanctions or internal rent competition. A conflict zone containing oilfields, pipelines or export terminals may attract armed competition because control of those assets can determine political survival. A maritime crisis around a chokepoint may have consequences far beyond the immediate theatre.[14]

For Europe, the issue is not theoretical. Eurostat's 2026 energy publication records that the EU imported 57 per cent of its available energy in 2024. It also records that oil and petroleum products accounted for the largest share of EU energy imports, followed by natural gas.[15]

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[10] Ross, *The Oil Curse*; Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley: University of California Press, 1997).

[11] European Court of Auditors, *Security of the Supply of Gas in the EU*; International Energy Agency, *Gas Market Report*.

[12] U.S. Energy Information Administration, *World Oil Transit Chokepoints*, Washington, DC, 2025.

[13] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant* (Paris: FATF, February 2015).

[14] Le Billon, *Fuelling War*; U.S. Energy Information Administration, *World Oil Transit Chokepoints*.

[15] Eurostat, Energy 2026 — Interactive Publication (Luxembourg: Publications Office of the European Union, 2026).

This means that, despite rapid progress since 2022, Europe remains structurally exposed to imported fossil energy.

The security significance of this exposure is amplified by the fact that fossil fuel prices affect the whole economy. Gas and electricity price spikes can raise household bills, increase industrial costs and contribute to inflation. Oil price shocks affect transport, logistics, food prices and military fuel costs. In democratic societies, such shocks can also generate political pressure that hostile actors may seek to exploit.[16]

1.3 Energy, sovereignty and strategic vulnerability

Energy sovereignty does not mean autarky. Few advanced economies can or should attempt to produce every component of their energy system domestically. Modern energy security requires trade, interconnection, investment and co-operation. The issue is not whether a state imports energy, technology or materials. The issue is whether its dependencies are diversified, transparent, resilient and politically manageable.[17]

Strategic vulnerability arises when a dependency is concentrated, difficult to replace and controlled by an actor able to exploit it. Fossil fuels often meet these conditions. A pipeline gas relationship can bind an importer to a specific producer and route. A refinery configured for particular crude grades may be less flexible than headline oil-market data suggest. A landlocked state dependent on a single pipeline corridor may have little room for manoeuvre. A maritime importer exposed to a distant chokepoint may be affected by events over which it has limited control.[18]

Sovereignty in this context should be understood as freedom of strategic action. A state is less sovereign when essential energy supplies depend on a supplier that can threaten, interrupt or manipulate them. It is also less sovereign when energy-price shocks restrict fiscal policy, create social stress or force emergency diplomatic concessions. Energy dependence can therefore affect the ability of governments to maintain sanctions, support allies, sustain defence production or protect households and industry during crisis.[19]

Russia's relationship with Europe before 2022 illustrates this problem. For years, Russian pipeline gas was often treated as a commercial issue. It was cheaper than alternatives in some markets, supported industrial demand and appeared to offer mutual interdependence. However, mutual interdependence was uneven. European consumers needed gas for heating, electricity and industry. Russia needed revenue, but it also possessed alternative means of absorbing short-term losses and had political incentives to exploit dependence. The

[16] European Central Bank, Economic Bulletin, Issue 4/2022, Frankfurt am Main: ECB, 2022; European Commission, Directorate-General for Economic and Financial Affairs, European Economic Forecast: Spring 2023, Institutional Paper 200, Luxembourg: Publications Office of the European Union, 2023.

[17] Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', Energy Policy, vol. 75, 2014.

[18] U.S. Energy Information Administration, World Oil Transit Chokepoints; European Court of Auditors, Security of the Supply of Gas in the EU.

[19] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

crisis revealed that what had been framed as economic efficiency also contained strategic exposure.[20]

The European Commission's REPowerEU materials show the scale of the adjustment. The Commission states that the EU is moving towards the full phase-out of Russian fossil fuel imports, including Russian gas, oil and coal, and current EU reporting records that Russia's share of EU gas imports had fallen to around 12 per cent by late 2025, from about 45 per cent before the full-scale invasion.21 These figures demonstrate progress, but they also underline the original vulnerability. A supplier able to provide almost half of imported gas to the EU had a position of strategic significance.

Strategic vulnerability also concerns infrastructure ownership and route dependency. Pipelines can bypass some countries and strengthen others. LNG terminals can change bargaining power. Storage capacity can determine whether a state can withstand winter pressure. Electricity interconnectors can increase resilience but also require cyber and physical protection. Undersea pipelines and cables have become central to both energy supply and digital connectivity. NATO has increasingly treated critical undersea infrastructure as a security concern, particularly after the sabotage of the Nord Stream pipelines in September 2022.[22]

The sovereignty question also extends beyond Europe. Producer states that rely heavily on hydrocarbon exports may appear powerful when prices are high, but they can become fiscally vulnerable when prices fall or when export routes are disrupted. Rentier economies often face weak diversification, inflated public sectors and political dependence on distributable revenue. In such systems, energy revenues can support regime stability but also create long-term fragility. The same dependence that provides short-term power may undermine resilience.[23]

For fossil fuel importers and exporters alike, sovereignty is therefore connected to diversification. Importers need diversified supply, lower demand, domestic low-carbon generation, storage and efficiency. Exporters need diversified economies, accountable institutions and transition strategies that reduce fiscal dependence on hydrocarbons. Transit states need infrastructure resilience and governance arrangements that prevent pipelines, ports and chokepoints from becoming tools of coercion.

The security objective is not isolation. It is resilience. A resilient energy system can absorb disruption, switch sources, reduce demand, protect infrastructure and maintain essential

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[20] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[21] Kate Abnett, 'EU Parliament Approves Phase-Out of Russian Gas Imports', *Reuters*, 17 December 2025; European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025.

[22] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[23] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

services during crisis. Fossil fuel dependence becomes dangerous when the system lacks these qualities.[24]

1.4 The link between environmental policy and defence policy

Environmental policy and defence policy have often been treated as separate domains. Environmental policy has focused on emissions, pollution, biodiversity, public health and climate commitments. Defence policy has focused on deterrence, military capability, territorial security, alliance commitments and crisis response. Fossil fuel dependence connects the two fields.

The same fossil fuel systems that drive emissions also generate security risks. Oil and gas revenues can finance military expansion and armed groups. Pipelines and refineries can become military targets. Coal and oil pollution can damage public health and weaken state capacity. Climate-related stress can interact with weak governance and displacement. Energy infrastructure attacks can create environmental harm as well as military and economic disruption. This makes fossil fuel dependence a cross-sectoral issue.[25]

The war in Ukraine has made this link visible. Russia's fossil fuel revenues have remained relevant to its fiscal and military capacity. Ukraine's energy infrastructure has been repeatedly targeted, affecting electricity, heating, industry and civilian life. Damage to refineries, depots, pipelines and power facilities creates environmental risks in addition to immediate operational effects. The World Bank, European Commission, United Nations and Government of Ukraine have documented very large reconstruction needs, with the energy sector among the most heavily affected areas in successive damage and needs assessments.[26]

Environmental damage is also a recurrent feature of fossil fuel-related conflict. The burning of Kuwaiti oil wells in 1991 remains one of the most prominent historical examples. United Nations Compensation Commission material records the environmental consequences of Iraq's invasion and occupation of Kuwait, including large-scale damage caused by the destruction of oil infrastructure.[27] The Niger Delta provides a different model: long-term oil extraction, pollution, sabotage, theft and weak governance have interacted over decades to produce insecurity and environmental degradation. UNEP's assessment of Ogoniland found severe oil contamination after more than fifty years of operations.[28]

These cases show that environmental harm is not simply a post-conflict clean-up issue. It can be part of the conflict system itself. Oil pollution can undermine livelihoods and fuel

[24] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State*; Ross, *The Oil Curse*.

[25] European Commission and High Representative, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final.

[26] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2023* (Washington, DC: World Bank, 2024); World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025).

[27] United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims*, S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims*, S/AC.26/2005/10, Geneva, 30 June 2005.

[28] United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011).

grievances. Gas flaring and methane leakage can harm local populations and contribute to climate change. Attacks on refineries, pipelines and power stations can release hazardous substances. Damage to electricity systems can affect water supply, hospitals, food storage and heating. Environmental security is therefore part of civilian protection, recovery planning and resilience.[29]

Defence policy increasingly recognises that climate and energy systems shape the operating environment. NATO identifies energy security as part of resilience and has drawn attention to the protection of critical energy infrastructure, including in the maritime and undersea domains.[30] Military forces also depend on fuel supply chains. Operational mobility, logistics, bases, ports and defence industries are all energy-intensive. A defence system dependent on vulnerable fuel supply routes may face constraints in a prolonged crisis.

This does not mean that defence policy should be subordinated to environmental policy, or that environmental policy should be militarised. It means that the two fields must be co-ordinated where their risks overlap. Energy transition can reduce strategic exposure, but only if it is implemented with grid resilience, cyber security, critical minerals strategy and infrastructure protection. Defence planning can improve resilience, but only if it accounts for energy demand, fuel logistics and environmental consequences.

1.5 Definitions and conceptual framework

A White Paper on fossil fuels and security requires clear definitions. Terms such as “energy weapon”, “resource war” and “energy security” are often used imprecisely. This paper therefore adopts a structured vocabulary to avoid overstatement and to distinguish between different forms of fossil fuel involvement in conflict.

The conceptual framework rests on five categories: fossil energy weaponisation, resource war, energy security, strategic resilience and environmental security. These categories overlap, but they should not be treated as interchangeable.

[29] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

[30] NATO, ‘Energy Security’, NATO, Brussels, accessed 4 June 2026; NATO, ‘NATO’s Role in Protecting Critical Undersea Infrastructure’, NATO, Brussels, accessed 4 June 2026.

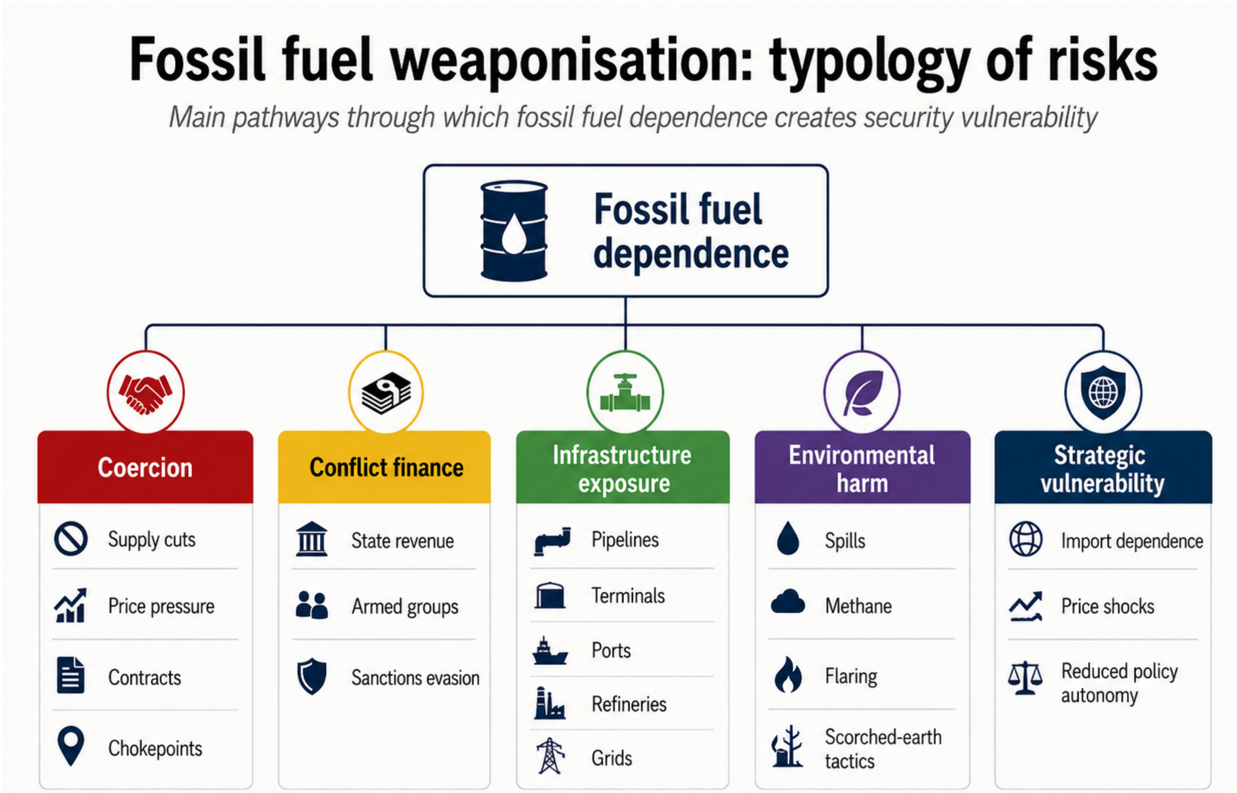

Figure 1. Fossil fuel weaponisation: typology of risks. Fossil fuel dependence creates multiple security pathways, including coercion, conflict finance, infrastructure exposure, environmental harm and reduced strategic autonomy.

1.5.1 Fossil energy weaponisation

For the purposes of this White Paper, fossil energy weaponisation means the deliberate use of oil, gas, coal, fuel supplies, prices, pipelines, ports, contracts, ownership structures or energy infrastructure to coerce, punish, reward or influence another actor.[31]

This definition includes direct and indirect forms of coercion. Direct coercion may include cutting off gas supplies, imposing an embargo, closing a pipeline, threatening tanker traffic or attacking energy infrastructure. Indirect coercion may include manipulating market expectations, imposing politically conditioned pricing, using long-term contracts to limit policy options, acquiring strategic infrastructure or financing political networks abroad.

Fossil energy weaponisation differs from ordinary market behaviour. A producer may raise prices for commercial reasons, or supply may fall because of technical failure. Such events may create insecurity, but they are not necessarily weaponisation. Weaponisation requires intent: the use or threat of energy leverage to influence another actor's behaviour.

[31]European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026.

Fossil energy weaponisation may be more effective where five conditions are present: dependence is high; alternatives are limited; infrastructure is fixed; the supplier can absorb short-term losses; and the target faces domestic political or economic pressure. Pipeline gas often meets these conditions more clearly than globally traded coal. Oil sits between the two: it is globally traded, but price shocks and chokepoint threats can still exert pressure.[32]

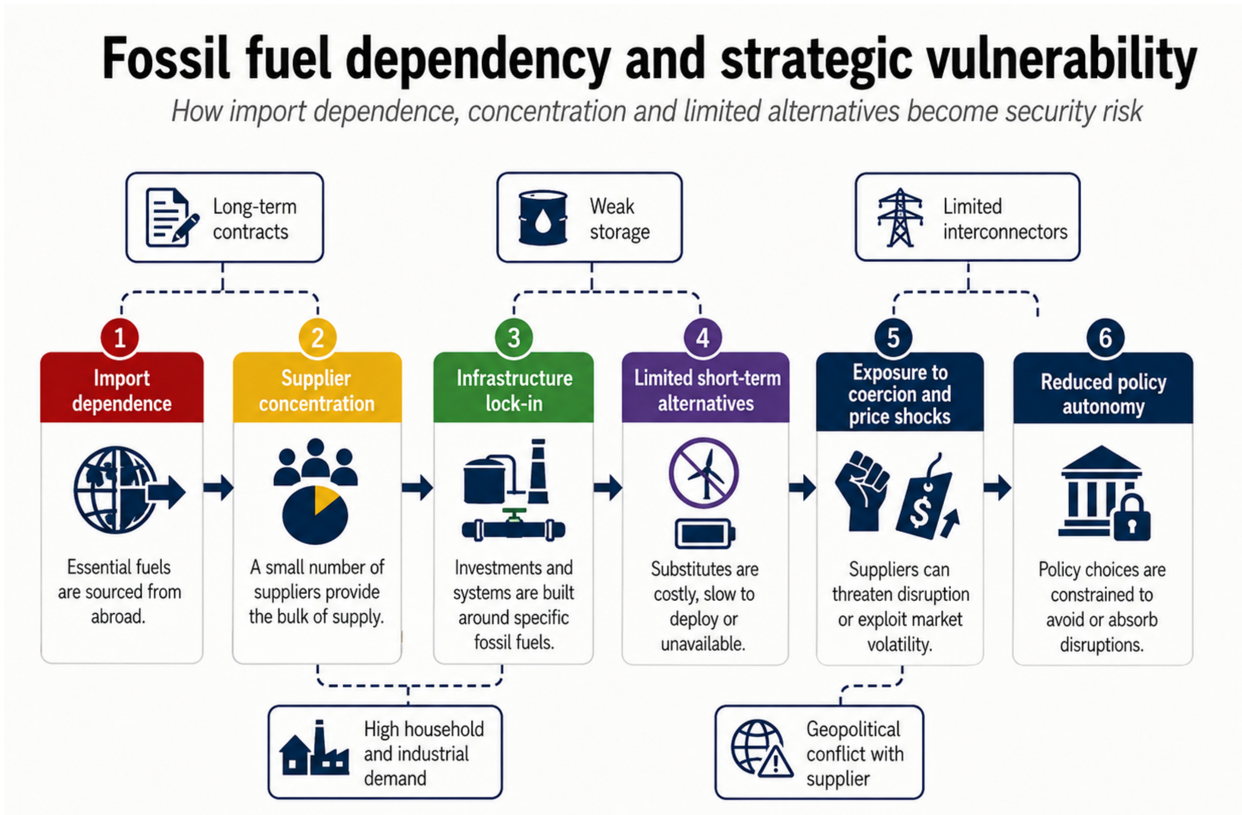

Figure 2. Fossil fuel dependency and strategic vulnerability. Fossil fuel dependence becomes a security risk when essential supply is concentrated, difficult to substitute and controlled by actors able to exploit disruption or uncertainty.

1.5.2 Resource war

For the purposes of this White Paper, a resource war is a conflict in which access to, control over, or revenue from natural resources is a significant driver of escalation, financing or strategic calculation. The term does not imply that resources are the sole cause of war.[33]

This definition is intentionally cautious. Wars are rarely fought for one reason. A conflict may involve territory, identity, regime survival, security dilemmas and external intervention at the same time. Fossil fuels may be one factor among several. The value of the resource-war

[32] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[33] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Paul Collier and Anke Hoeffler, 'Greed and Grievance in Civil War', *Oxford Economic Papers*, vol. 56, no. 4, 2004, pp. 563–595.

concept lies not in reducing conflict to oil or gas, but in identifying how control of revenue-generating assets can shape incentives.

A fossil fuel resource may contribute to conflict in several ways. It may be a territorial prize, as in disputes over oilfields or offshore reserves. It may provide revenue that enables military operations. It may become a bargaining asset in negotiations. It may attract external intervention. It may sustain armed groups through smuggling. It may deepen internal competition within weak states.[34]

The resource-war concept is useful only when applied with discipline. The evidence should show that fossil fuel assets materially affected decisions, financing, territorial control or conflict duration. Where that evidence is weak, the analysis should not force an energy explanation.

1.5.3 Energy security

For the purposes of this White Paper, energy security means reliable, affordable and sustainable access to energy without exposure to coercion or unacceptable strategic risk.

This definition builds on the International Energy Agency's emphasis on reliable and affordable access to energy, while adding two elements required for contemporary security analysis: sustainability and exposure to coercion.[35]

Energy security has traditionally focused on supply continuity. That remains essential. States need sufficient energy to heat homes, power industry, move goods, operate hospitals and maintain military readiness. However, modern energy security also concerns price stability, infrastructure protection, cyber resilience, climate commitments, environmental risk and geopolitical dependency.[36]

A secure energy system should meet several tests. It should be diversified across sources and routes. It should have adequate storage and emergency planning. It should be affordable enough to maintain social and industrial stability. It should be resilient to physical and cyberattack. It should not depend excessively on hostile or unstable suppliers. It should be compatible with long-term environmental sustainability.

This last point is sometimes treated as secondary to immediate supply security. That is a mistake. A system that is affordable and reliable in the short term but environmentally destructive and geopolitically coercible in the long term is not truly secure. Climate change, pollution and ecosystem damage can create security pressures of their own. Energy security and environmental security are therefore connected.[37]

[34] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Philippe Le Billon, 'The Political Ecology of War: Natural Resources and Armed Conflicts', *Political Geography*, vol. 20, no. 5, 2001, pp. 561–584.

[35] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[36] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; European Union Agency for Cybersecurity, *ENISA Threat Landscape 2024* (Athens: ENISA, 2024).

[37] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

The energy transition changes the meaning of energy security. In a fossil system, security often means securing fuel flows. In an electrified renewable system, security increasingly means securing grids, storage, balancing capacity, critical minerals, digital control systems and manufacturing supply chains. This shift does not eliminate risk. It changes its form.[38]

1.5.4 Strategic resilience

For the purposes of this White Paper, strategic resilience means the capacity of a state, alliance or energy system to absorb disruption, maintain essential functions, adapt under pressure and recover without conceding political autonomy.

Strategic resilience is broader than energy security. It includes infrastructure, institutions, supply chains, public trust, defence planning, industrial capacity and emergency governance. A resilient energy system is not one that never experiences shocks. It is one that can withstand shocks without systemic failure.[39]

In the fossil fuel context, resilience requires reduced demand, diversified imports, storage, alternative routes, emergency reserves, protected infrastructure and market transparency. In the renewable context, it requires grid reinforcement, storage, flexible demand, cyber security, diversified critical minerals, recycling, domestic or allied manufacturing capacity and public acceptance.

Strategic resilience also implies political resilience. Energy shocks can be used to create social pressure. High prices can weaken support for foreign policy, sanctions or military assistance. Disinformation can exploit energy anxiety. Governments therefore need not only technical resilience but also public communication, targeted support for vulnerable households and transparent policy design.

For Europe, strategic resilience means avoiding the replacement of one vulnerability with another. Reducing Russian gas imports is necessary but insufficient if Europe becomes overly dependent on a narrow set of LNG suppliers, critical mineral processors or clean-technology manufacturers. The security objective must be diversification across the entire energy system.[40]

[38] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[39] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026.

[40] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

Term	Working definition	Strategic relevance
Fossil energy weaponisation	The deliberate use of oil, gas, coal, fuel supplies, prices, infrastructure, ports, pipelines or transit routes to coerce, punish, reward or influence another actor.	Shows how energy systems can be turned into instruments of pressure rather than neutral commodities.
Resource war	Conflict in which access to, control over, or revenue from natural resources is a significant driver, even if not the only cause.	Helps distinguish direct resource-related conflict from broader wars where resources are only an enabling factor.
Energy security	Reliable, affordable and sustainable access to energy without exposure to coercion or unacceptable strategic risk.	Connects energy policy to sovereignty, resilience and defence planning.
Strategic resilience	The capacity of a state or system to withstand, adapt to and recover from energy-related disruption, coercion or infrastructure attack.	Frames the policy objective of reducing vulnerability.
Conflict finance	Revenue streams that sustain military operations, armed groups, internal repression or proxy networks.	Explains how fossil revenues can prolong or intensify conflict.
Chokepoint	A narrow maritime passage or infrastructure corridor through which large volumes of energy trade pass.	Highlights concentrated vulnerabilities with global effects.
Critical infrastructure	Assets such as pipelines, LNG terminals, refineries, ports, electricity grids, interconnectors and offshore facilities essential to energy supply.	Identifies the infrastructure most vulnerable to sabotage, coercion or attack.

Table 1. Key definitions used in the White Paper

1.6 Methodological approach

This White Paper uses a comparative policy methodology. It does not attempt to prove a single universal theory of fossil fuels and war. Instead, it classifies fossil fuel involvement in conflict and insecurity through recurring pathways.

The methodology rests on five analytical categories.

Direct cause refers to conflicts in which control over fossil fuel reserves, revenue, territory or transit routes is a material driver of escalation.

Enabling factor refers to cases in which fossil fuel revenues materially sustain military operations, repression, patronage, armed groups or sanctions evasion.

Instrument of coercion refers to deliberate use of fossil fuel supply, pricing, infrastructure or contracts to influence another actor's behaviour.

Conflict multiplier refers to situations in which fossil fuel dependence increases the severity of economic, political or military crisis.

Environmental consequence refers to pollution, emissions, ecosystem damage, public-health harm or reconstruction burdens caused by extraction, combustion, sabotage or wartime targeting.[41]

This framework is designed to avoid two errors. The first is underestimation: treating fossil fuels as ordinary commodities and ignoring their role in coercion, war finance and infrastructure vulnerability. The second is overstatement: claiming that fossil fuels automatically explain conflict. The framework allows for a more precise judgement.

The paper draws on several types of evidence. Official EU and Eurostat material is used to assess European energy dependence and post-2022 adjustment. International Energy Agency material is used for energy-security concepts and transition-related risk. NATO material is used for critical infrastructure, energy security and hybrid threats. World Bank, IMF and academic work is used for political economy and resource-dependence analysis. UNEP and UN-related material is used for environmental consequences. SIPRI, FATF and specialist energy-trade research are used for military expenditure and conflict-finance pathways.[42]

The case-study method is illustrative rather than exhaustive. The selected cases are not intended to cover every conflict involving fossil fuels. They are chosen because each demonstrates a specific pathway.

Russia and Europe demonstrate coercion, import dependence and fossil-funded war capacity. The 1973–74 oil embargo demonstrates deliberate supply leverage. ISIS demonstrates non-state conflict finance through oil. Libya demonstrates the role of export infrastructure in fragmented authority. Sudan and South Sudan demonstrate fiscal dependence and route vulnerability. The Niger Delta demonstrates the connection between extraction, pollution, theft and insecurity. Kuwait in 1991 demonstrates wartime environmental destruction. Ukraine demonstrates the combined security and environmental consequences of energy infrastructure targeting.[43]

The methodology also recognises uncertainty. Some evidence is quantitative, such as import dependence, revenue estimates, trade volumes and military expenditure. Some evidence is

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[41] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009).

[42] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; World Bank, *Natural Resources and Violent Conflict: Options and Actions* (Washington, DC: World Bank, 2003); Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015); Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026.

[43] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015); United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025).

qualitative, such as strategic intent, coercive signalling and governance effects. Where causation cannot be established firmly, the paper uses cautious language. It distinguishes between evidence of direct causation, enabling contribution and contextual amplification.

The analysis is global in scope but European in policy emphasis. The main institutional audience is the EU, NATO, Member States, parliamentary committees, energy-security experts and defence planners. The recommendations are therefore focused on European and allied policy instruments: energy transition, infrastructure protection, sanctions enforcement, critical minerals, external partnerships, conflict prevention and environmental accountability.

1.7 Structure of the White Paper

The White Paper proceeds from concept to evidence and then to policy.

Chapter 1 establishes the central argument, defines key terms and explains the methodology. It frames fossil fuels as a security problem and sets out the conceptual categories used throughout the paper.

Chapter 2 provides the historical background. It examines the role of coal and oil in the transformation of military power, the strategic importance of Middle Eastern oil, the Second World War, the 1973–74 oil embargo, the Iran-Iraq War, Iraq's invasion of Kuwait and the strategic lessons of twentieth-century fossil fuel politics.

Chapter 3 examines the political economy of fossil fuel dependence. It considers the resource curse, rentier-state economics, corruption, patronage, authoritarian resilience, military spending and the exposure of import-dependent states to external pressure.

Chapter 4 analyses fossil fuels as instruments of coercion. It examines supply cuts, threatened disruption, price manipulation, long-term contracts, infrastructure ownership and pipeline politics. Russia's use of gas against Europe is treated as the central European case study.

Chapter 5 focuses on fossil fuels and the financing of war. It assesses how hydrocarbon revenues can support state military capacity, non-state armed groups, proxy networks, sanctions evasion and internal repression. Case studies include Russia, ISIS, Libya, Sudan and South Sudan, and Iran.

Chapter 6 examines chokepoints and infrastructure vulnerability. It analyses maritime routes such as the Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits and the Strait of Malacca, as well as pipelines, LNG terminals, refineries, storage facilities and undersea infrastructure.

Chapter 7 links fossil fuels to environmental damage and conflict multiplication. It examines oil spills, gas flaring, methane leakage, coal pollution, scorched-earth tactics, attacks on energy infrastructure and the relationship between climate stress, weak governance and instability.

Chapter 8 focuses on Europe's exposure and strategic response. It assesses Europe's dependence on imported fossil fuels, the shock caused by Russia's invasion of Ukraine, REPowerEU, LNG diversification, renewable deployment, sanctions, NATO's role and the need for an integrated European energy-security doctrine.

Chapter 9 provides balance by examining renewable energy and the limits of the security argument. It recognises that renewables reduce some fossil-related vulnerabilities but introduce new dependencies linked to critical minerals, manufacturing, grids, storage, cyber security and permitting.

Chapter 10 sets out policy recommendations. These include formal recognition of fossil fuel dependence as a security vulnerability, demand reduction, electrification, renewables, grid expansion, critical infrastructure protection, sanctions enforcement, critical minerals strategy, diversification support for producer states and environmental accountability.

Chapter 11 concludes by returning to the central thesis: fossil fuels have created patterns of coercion, conflict financing, infrastructure vulnerability and environmental harm. A transition away from fossil fuels should therefore be treated as part of a wider strategic transition from dependence to resilience.

The annexes provide the methodological framework, typology of fossil fuel involvement in conflict, case-study matrix, policy implementation matrix, indicators for monitoring fossil fuel security risk and bibliography. These annexes are designed to support institutional use of the White Paper by allowing policymakers and analysts to apply the framework to future cases.

Chapter 2

Oil, Empire and Modern Warfare: Historical Background

2.1 Coal, oil and the transformation of military power

The relationship between fossil fuels and modern warfare predates oil. Coal was the first industrial fuel to transform the scale, speed and reach of military power. It powered steamships, railways, factories, foundries and the heavy industrial base on which modern armies and navies depended. Coal allowed states to move troops and materiel faster than animal power or sail, to produce steel and weapons at industrial scale, and to sustain large fleets through networks of coaling stations.[44]

[44] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); Vaclav Smil, *Energy and Civilization: A History* (Cambridge, MA: MIT Press, 2017).

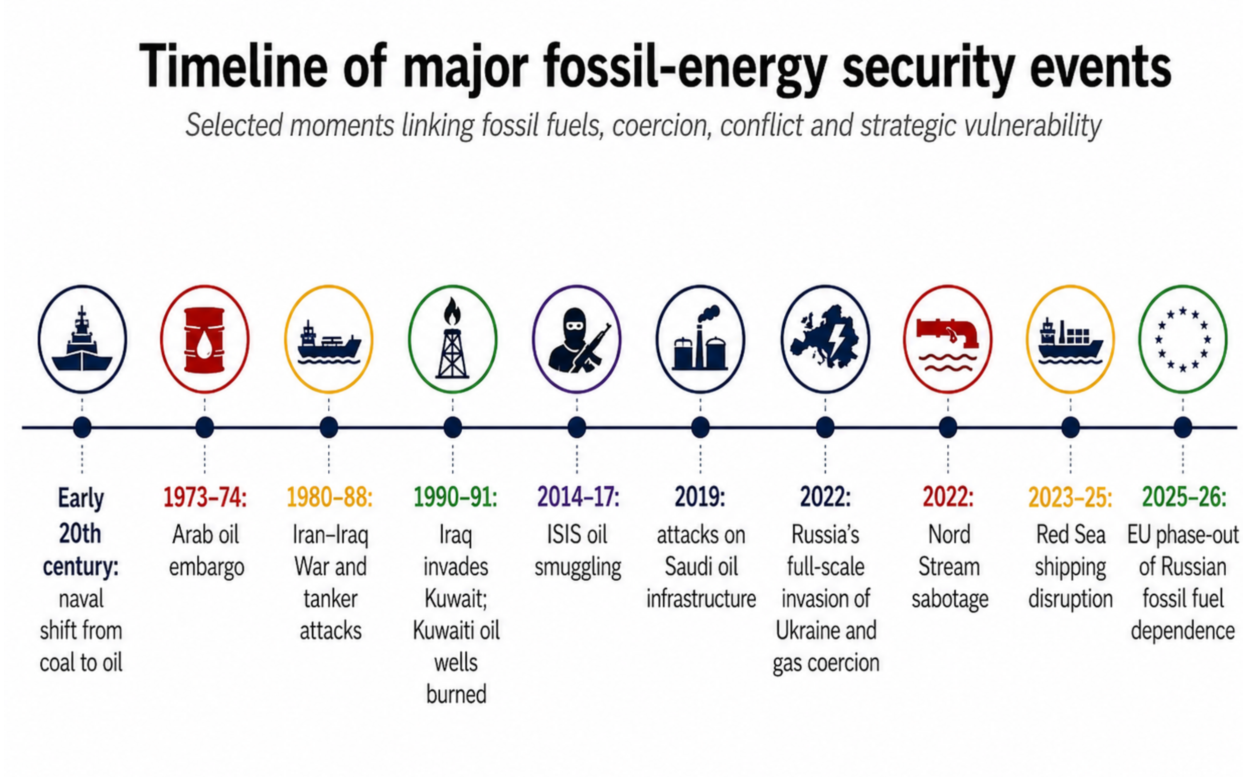

Figure 9. Timeline of major fossil-energy security events. Fossil fuels have shaped strategic calculations, coercion, conflict finance and infrastructure vulnerability across more than a century of modern conflict.

In the nineteenth century, coal was not simply an energy source. It was an imperial asset. Naval powers required coaling stations to sustain overseas fleets. Industrial states required reliable coal supplies to maintain arms production, rail transport and economic mobilisation. The geography of coal shaped the geography of power. States with domestic coal reserves enjoyed an advantage; states without them required supply routes, colonial holdings or commercial access.[45]

The transition from coal to oil did not reduce the strategic importance of energy. It intensified it. Oil offered military advantages that coal could not match. It had higher energy density, required fewer personnel to handle, produced less smoke, allowed faster refuelling, increased range and made more efficient ship design possible. For navies, oil-fired propulsion made vessels faster and more flexible. For armies, oil-powered vehicles, aircraft and mechanised logistics later transformed operational mobility. For air forces, petroleum became indispensable.[46]

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[45] Michael Adas, Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance (Ithaca, NY: Cornell University Press, 1989); John Darwin, The Empire Project: The Rise and Fall of the British World-System, 1830–1970 (Cambridge: Cambridge University Pess, 2009).

[46] Geoffrey Jones, The State and the Emergence of the British Oil Industry (London: Macmillan, 1981); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

Yet oil also introduced new vulnerabilities. A coal-rich state such as Britain could rely heavily on domestic coal reserves. Oil, by contrast, had to be secured from distant regions, commercial concessions and maritime supply routes. This meant that the adoption of oil increased military performance while creating external dependence. The Royal Navy's pre-First World War shift from coal to oil is a central example. The move from Welsh coal to foreign oil brought operational advantages, but it also exposed Britain to the strategic problem of securing supplies outside its own territory.[47]

This pattern has recurred throughout modern energy history. A new energy system may increase capability, but it also creates new dependencies. Coal created dependence on mines, railways and coaling stations. Oil created dependence on wells, refineries, tanker routes and overseas concessions. Natural gas later created dependence on pipelines, compressor stations, LNG terminals and storage systems. In each case, military power and energy security became linked.[48]

The importance of fossil fuels to warfare should therefore be understood in structural terms. Modern militaries do not simply consume energy. They are built around energy systems. Warships, tanks, aircraft, trucks, command networks, ammunition factories and logistics chains all depend on energy supply. Denial of energy can slow operations, raise costs, restrict manoeuvre and weaken industrial production. Control over energy can extend strategic reach.[54]

This chapter traces the historical development of that relationship. It does not argue that fossil fuels caused all major conflicts of the twentieth century. Rather, it shows that fossil fuels repeatedly shaped strategic planning, military logistics, alliance behaviour, coercive diplomacy and post-war security architecture. The history of coal, oil and war is therefore not an isolated background theme. It is the foundation for understanding why fossil fuel dependence remains a security issue today.[49]

2.2 Naval strategy and the shift from coal to oil

The naval transition from coal to oil was one of the most consequential energy shifts in modern military history. It demonstrated that energy choices could alter operational capability, industrial planning and geopolitical dependency at the same time.[50]

Coal-fired navies required large crews of stokers, regular access to coaling stations and labour-intensive refuelling. Coal created smoke, which could reveal a fleet's position. It also occupied significant storage space. Oil offered clear advantages. It could be pumped rather than shovelled, stored more flexibly, burned more efficiently and used to raise steam more

[47] Geoffrey Jones, *The State and the Emergence of the British Oil Industry* (London: Macmillan, 1981); David Edgerton, *Warfare State: Britain, 1920–1970* (Cambridge: Cambridge University Press, 2006).

[48] Vaclav Smil, *Energy and Civilization: A History* (Cambridge, MA: MIT Press, 2017); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[49] Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge: Cambridge University Press, 1977); Richard Overy, *Why the Allies Won* (London: Jonathan Cape, 1995).

[50] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); Michael T. Klare, *Resource Wars: The New Landscape of Global Conflict* (New York: Metropolitan Books, 2001).

quickly. Oil-fired vessels could accelerate faster and operate with fewer personnel assigned to fuel handling.[51]

For the Royal Navy, the decision to adopt oil was not purely technical. It involved a strategic trade-off. Britain possessed abundant coal but limited domestic oil. Moving the fleet towards oil meant relying on foreign or imperial sources of supply. The operational gain was therefore accompanied by a supply-security problem. Winston Churchill and Admiral Sir John Fisher supported the move because they judged that the advantages were decisive, but the decision required the British state to think differently about energy and empire.[52]

The Queen Elizabeth-class battleships, ordered before the First World War, symbolised the shift. They were designed to burn oil rather than coal, improving speed and performance. The broader lesson was that fuel choice could affect naval strategy. Oil allowed more capable vessels, but it also made access to oilfields, refineries and sea lanes a matter of national security.[53]

This was not only a British development. Other navies adopted oil-fired propulsion as the advantages became clear. The United States also moved gradually towards oil, supported by domestic reserves and the establishment of naval petroleum reserves. Oil became a strategic naval fuel because it enabled speed, range and flexibility. Once major fleets adopted it, oil supply became a core element of maritime power.[54]

The consequences extended beyond ship design. Navies now needed secure access to oil stocks, tanker fleets, refuelling points and overseas sources. The security of supply routes became more important. A naval power could not rely only on the quality of its ships; it had to ensure that those ships could be fuelled. Energy logistics became a determinant of operational freedom.[55]

The shift from coal to oil also changed the relationship between military power and global geography. Coal had tied navies to coaling stations; oil tied them to petroleum-producing regions and tanker routes. This helped make the Middle East, the Caucasus, the Caribbean and later the Persian Gulf more significant in strategic thinking. Oil fields and sea routes became part of the map of military security.[56]

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[51] Norman Friedman, *Battleship Design and Development 1905–1945* (London: Conway Maritime Press, 1978); Arthur J. Marder, *From the Dreadnought to Scapa Flow*, vol. 1 (Oxford: Oxford University Press, 1961).

[52] Winston S. Churchill, *The World Crisis, 1911–1918* (London: Thornton Butterworth, 1923); Arthur J. Marder, *From the Dreadnought to Scapa Flow*, vol. 1 (Oxford: Oxford University Press, 1961).

[53] Norman Friedman, *Battleship Design and Development 1905–1945* (London: Conway Maritime Press, 1978); Nicholas A. Lambert, *Sir John Fisher's Naval Revolution* (Columbia, SC: University of South Carolina Press, 1999).

[54] David S. Painter, Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954 (Baltimore, MD: Johns Hopkins University Press, 1986).

[55] Martin van Creveld, Supplying War: Logistics from Wallenstein to Patton (Cambridge: Cambridge University Press, 1977); Richard Overy, Why the Allies Won (London: Jonathan Cape, 1995).

[56] Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991); Geoffrey Jones, The State and the Emergence of the British Oil Industry (London: Macmillan, 1981).

2.3 Middle Eastern oil and the post-First World War settlement

The post-First World War settlement increased the strategic importance of Middle Eastern oil. The collapse of the Ottoman Empire, the emergence of British and French mandates, and the growth of oil concessions placed energy access within the wider architecture of imperial and post-imperial power.[57]

Before the First World War, the Middle East was not yet the dominant centre of global oil production. The United States, Russia, Mexico and parts of the Caribbean were central to early oil supply. However, the region's potential became increasingly clear. Discoveries and concessions in Persia, Iraq and later the Gulf states gradually transformed the Middle East into a strategic energy zone.[58]

The British interest in Persian oil predated the war. The Anglo-Persian Oil Company, later British Petroleum, became central to British naval fuel planning. The British government's stake in the company reflected the strategic importance attached to oil supply. Energy policy, commercial concession and naval strategy were already connected before the post-war settlement was finalised.[59]

After 1918, the redrawing of boundaries and mandates created new political structures around oil-bearing territories. Iraq, under British mandate, became particularly important because of its potential reserves and location. Pipeline routes from Iraq to the Mediterranean later became part of the regional energy system. Oil concessions involved Western companies, local rulers and imperial authorities. Control of production, taxation and transit would become recurring sources of political tension.[60]

Oil did not determine Middle Eastern politics, but it shaped external interests, concessionary arrangements and regional alliances.[61]

The longer-term result was the creation of a security relationship between industrial importers and oil-producing territories. Western states wanted stable access to oil. Producer states and rulers sought revenue, protection and political advantage. Oil companies sought concessions and predictable operating conditions. These interests did not always align. The uneven distribution of power between companies, imperial authorities and local populations created grievances that later fed nationalist politics.[62]

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[57] David Fromkin, A Peace to End All Peace: The Fall of the Ottoman Empire and the Creation of the Modern Middle East (New York: Henry Holt, 1989); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

[58] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); Fiona Venn, *Oil Diplomacy in the Twentieth Century* (Basingstoke: Macmillan, 1986).

[59] Geoffrey Jones, *The State and the Emergence of the British Oil Industry* (London: Macmillan, 1981); Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991).

[60] Charles Tripp, *A History of Iraq* (Cambridge: Cambridge University Press, 2007); David Fromkin, *A Peace to End All Peace: The Fall of the Ottoman Empire and the Creation of the Modern Middle East* (New York: Henry Holt, 1989).

[61] David Fromkin, A Peace to End All Peace: The Fall of the Ottoman Empire and the Creation of the Modern Middle East (New York: Henry Holt, 1989); Eugene Rogan, The Arabs: A History (London: Allen Lane, 2009).

[62] Timothy Mitchell, Carbon Democracy: Political Power in the Age of Oil (London: Verso, 2011); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

The significance for this White Paper is that oil became embedded in state formation and international order. It was not merely extracted from the region; it helped shape the relationship between the region and external powers. The twentieth-century security architecture of the Middle East cannot be understood without recognising the role of oil in external intervention, alliance management, arms sales, regime support and maritime security.[63]

The post-First World War period therefore created an enduring pattern. Fossil fuels became strategic assets around which external powers built policies of access, protection and influence. This pattern would become more visible during the Second World War, the Cold War, the 1973 embargo, the Iran-Iraq War, the Gulf War and later crises around the Strait of Hormuz.

2.4 Oil supply and the Second World War

The Second World War confirmed that oil was indispensable to modern military power. Mechanised war required fuel at every level. Tanks, aircraft, trucks, ships, submarines and industrial production all depended on petroleum. Control over oil supplies, and denial of oil to adversaries, became central to strategy.[64]

Germany entered the war with a structural oil problem. It had limited domestic petroleum and relied heavily on synthetic fuel production, imports and captured resources. The German military's need for fuel shaped operational planning. The drive towards the Caucasus in 1942 reflected, among other strategic objectives, the desire to reach Soviet oil resources. Failure to secure and exploit those resources contributed to the limits of German operational mobility.[65]

Japan faced an even sharper oil-security dilemma. Its industrial and military expansion depended on imported oil, much of it affected by United States and Allied restrictions before Pearl Harbour. The Japanese leadership saw access to Southeast Asian resources, including oil, as essential to sustaining its war effort. The attack on Pearl Harbour and the wider offensive into Southeast Asia cannot be reduced only to oil, but oil denial and resource access were central to the strategic context.[66]

For the Allies, oil was a major advantage. The United States possessed large domestic production and refining capacity. Allied control of sea lanes and access to petroleum allowed sustained mechanised operations. Fuel supply shaped the pace of campaigns, including the logistical challenges after the Normandy landings. Even successful armies could be

[63] David S. Painter, Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954 (Baltimore, MD: Johns Hopkins University Press, 1986); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

[64] Richard Overy, Why the Allies Won (London: Jonathan Cape, 1995); Adam Tooze, The Wages of Destruction: The Making and Breaking of the Nazi Economy (London: Allen Lane, 2006).

[65] Adam Tooze, The Wages of Destruction: The Making and Breaking of the Nazi Economy (London: Allen Lane, 2006); Joel Hayward, Stopped at Stalingrad: The Luftwaffe and Hitler's Defeat in the East, 1942–1943 (Lawrence, KS: University Press of Kansas, 1998).

[66] Edward S. Miller, Bankrupting the Enemy: The U.S. Financial Siege of Japan before Pearl Harbor (Annapolis, MD: Naval Institute Press, 2007); Akira Iriye, The Origins of the Second World War in Asia and the Pacific (London: Longman, 1987).

constrained by fuel availability. The advance of Allied forces in Europe required a vast logistics system to deliver fuel to the front.[67]

The war also showed that energy infrastructure was a military target. Refineries, synthetic fuel plants, oil storage depots, tanker fleets and transport networks became targets for bombing and naval interdiction. Destroying an adversary's energy system could weaken air operations, ground mobility and industrial output. This logic remains relevant today, as attacks on refineries, power grids and fuel depots continue to feature in modern conflict.[68]

Several lessons emerge from the Second World War:

1. Oil was an operational necessity. Modern military mobility depended on reliable fuel supply. Armies and air forces could not function at scale without petroleum.
2. Oil was a strategic objective. States sought to secure access to oilfields, shipping routes and refining capacity. Denial of oil could alter strategic decisions.
3. Oil infrastructure was a military target in the logic of industrial war. Refineries and transport systems became part of the battlefield.
4. Oil logistics could determine tempo. Even when forces were victorious, inadequate fuel supply could slow operations.

The Second World War therefore established the full military meaning of oil. It was not simply a commodity that armies bought. It was a condition of operational power. This historical experience influenced post-war planning, strategic stockpiling, alliance policy and the later creation of emergency energy institutions.[69]

2.5 The 1973–74 oil embargo and the politics of energy leverage

The 1973–74 oil embargo is the clearest historical example of fossil fuel supply being used as deliberate geopolitical leverage. During the October 1973 Arab-Israeli War, Arab members of OPEC imposed an embargo against the United States and other states perceived as supporting Israel. The embargo combined restrictions on exports with production cuts and occurred in a wider context of changing relations between oil-producing states and international oil companies.[70]

The embargo had immediate and lasting effects. It contributed to fuel shortages, price increases, inflation, economic disruption and policy change in importing states. It demonstrated that oil exporters could use supply as an instrument of diplomacy. It also showed that industrialised importers were vulnerable when they depended on external oil

[67] Richard Overy, Why the Allies Won (London: Jonathan Cape, 1995); Martin van Creveld, Supplying War: Logistics from Wallenstein to Patton (Cambridge: Cambridge University Press, 1977).

[68] Adam Tooze, The Wages of Destruction: The Making and Breaking of the Nazi Economy (London: Allen Lane, 2006); Richard G. Davis, Carl A. Spaatz and the Air War in Europe (Washington, DC: Center for Air Force History, 1993).

[69] David S. Painter, *Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954* (Baltimore, MD: Johns Hopkins University Press, 1986); International Energy Agency, 'History of the IEA', IEA, accessed 4 June 2026.

[70] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026.

supplies without adequate co-ordination, stockholding or demand-management mechanisms.[71]

The political purpose of the embargo was explicit. It was imposed in retaliation for support to Israel and to gain leverage in post-war diplomacy. This makes it different from a normal price movement or commercial dispute. It was a conscious use of energy supply for political objectives.

The embargo also exposed a structural shift in power. For decades, Western oil companies and importing states had exercised strong influence over production, pricing and concessions. By the 1970s, producing states were asserting greater control. OPEC became a more consequential actor. Oil was no longer managed primarily through company-state arrangements favourable to importers. Producer governments were now able to co-ordinate action and influence global markets.[72]

The institutional response was equally significant. The International Energy Agency was created in 1974 in response to the oil crisis, with an initial mandate centred on oil supply security and policy co-operation among industrialised importers. The IEA was founded after the 1973–74 oil crisis, when the embargo and price shock exposed the vulnerability of industrialised countries to oil-import dependence.[73]

The IEA's emergency response system, including stockholding obligations, reflected the lesson that energy security required collective preparation. IEA members are required to hold oil stocks equivalent to at least 90 days of net oil imports and to be ready to respond collectively to severe supply disruptions.[74]

The embargo transformed energy policy in several ways:

1. It made energy security a formal policy field. Importing states began to treat oil supply as a strategic risk rather than a purely commercial matter.
2. It encouraged diversification. Importers sought alternative suppliers, domestic production, nuclear power, efficiency measures and strategic reserves.
3. It changed economic policy. Energy prices became a central factor in inflation, industrial planning and macroeconomic stability.
4. It altered foreign policy. Relations with producer states became more important, while Middle Eastern security acquired direct economic significance for industrialised economies.

The 1973–74 embargo remains central to this White Paper because it demonstrates the core mechanism of fossil energy weaponisation. A producer group used supply restrictions to influence the behaviour of importers. The effect was not limited to fuel availability; it affected

[71] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); Fiona Venn, *Oil Diplomacy in the Twentieth Century* (Basingstoke: Macmillan, 1986).

[72] Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991); Timothy Mitchell, Carbon Democracy: Political Power in the Age of Oil (London: Verso, 2011).

[73] International Energy Agency, 'History of the IEA', IEA, accessed 4 June 2026.

[74] International Energy Agency, 'Oil Security and Emergency Response', IEA, accessed 4 June 2026.

inflation, public confidence, alliance politics and institutional design. It remains the historical benchmark for understanding later cases of energy coercion, including Russia's gas leverage over Europe.

2.6 The Iran-Iraq War and attacks on energy infrastructure

The Iran-Iraq War of 1980–88 demonstrated how fossil fuel infrastructure can become both a target and a source of strategic vulnerability during prolonged conflict. The war had multiple causes, including territorial disputes, revolutionary politics, regime insecurity and regional rivalry. It should not be reduced to oil. However, oil revenue, export capacity, ports, tankers and Gulf shipping routes were central to the conflict's economic and strategic environment.[75]

Both Iran and Iraq depended heavily on oil revenue. Sustaining the war required income, foreign exchange and access to export routes. As the conflict dragged on, attacks on energy infrastructure and shipping became part of the strategy. Oil terminals, refineries, tankers and port facilities were vulnerable to air and missile attack. The so-called Tanker War phase expanded the conflict into the Gulf's maritime routes, threatening neutral shipping and drawing in external naval powers.[76]

The targeting of tankers and oil facilities revealed several enduring features of fossil fuel conflict:

1. Oil exports can sustain war economies. States dependent on oil revenue may continue fighting as long as they can export enough crude to finance military operations and imports.
2. Export infrastructure is a strategic target. Terminals, refineries and ports are not merely economic assets. They are wartime vulnerabilities because damaging them can reduce revenue and weaken state capacity.
3. Maritime energy routes can internationalise conflict. When attacks threaten global oil flows or neutral shipping, external powers become more likely to intervene, escort vessels or increase naval presence.
4. Energy markets react to risk even when physical supply is only partially disrupted. The threat of disruption can affect prices, insurance and shipping behaviour.[77]

The Iran-Iraq War also showed the limits of energy power. Oil revenue allowed both states to sustain the war, but dependence on oil also made them vulnerable. Each side had incentives to damage the other's export capacity. The same resource that financed military operations became a target.

This dual role is a recurring theme in fossil fuel security. Oil and gas infrastructure can be both a source of strength and a point of weakness. A pipeline may provide revenue, but it can

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[75] Dilip Hiro, *The Longest War: The Iran-Iraq Military Conflict* (London: Routledge, 1991); Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War, Volume II: The Iran-Iraq War* (Boulder, CO: Westview Press, 1990).

[76] Ibid.

[77] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report* (Paris: IEA, 2025).

be sabotaged. A refinery may support military logistics, but it can be bombed. A tanker route may connect a producer to global markets, but it can be mined or harassed. Fossil systems are powerful precisely because they are concentrated; they are vulnerable for the same reason.

The Iran-Iraq War also foreshadowed later concerns about Gulf energy routes, tanker security and attacks on energy infrastructure.[78]

2.7 Iraq's invasion of Kuwait and the strategic value of oil reserves

Iraq's invasion of Kuwait in August 1990 is one of the most important cases for understanding the relationship between oil, strategic calculation and war. The conflict cannot be explained solely by oil. It involved Iraqi debt after the Iran-Iraq War, disputes over production levels, claims about Kuwaiti drilling practices, territorial grievance, regime ambition and miscalculation. Nevertheless, oil was central to the strategic and economic context.[79]

Iraq emerged from the Iran-Iraq War heavily indebted and economically strained. Oil revenue was essential to reconstruction and regime stability. Iraq accused Kuwait of overproducing oil, contributing to lower prices and harming Iraqi revenue. It also accused Kuwait of exploiting the Rumaila oilfield across the border. These claims formed part of Iraq's political justification for pressure on Kuwait.[80]

Kuwait's oil reserves and export capacity made it a strategic prize. Control over Kuwait would have increased Iraq's share of global oil reserves and strengthened its position in the Gulf. It would also have placed Iraq in a more powerful position relative to Saudi Arabia and other producers. For external powers, the possibility that Iraq might dominate a large share of Gulf oil reserves was unacceptable. This was one reason the invasion prompted a major international military response.[81]

The 1990–91 crisis shows why fossil fuels must be analysed carefully. Oil was not the only cause of Iraq's decision, but it shaped the stakes. It influenced Iraq's economic grievances, its potential gains, the regional balance of power and the international response. The conflict fits the White Paper's taxonomy as a case in which fossil fuels were a material strategic factor, not as a monocausal "war for oil".[82]

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[78] Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War, Volume II: The Iran-Iraq War* (Boulder, CO: Westview Press, 1990); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[79] Lawrence Freedman and Efraim Karsh, The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order (Princeton, NJ: Princeton University Press, 1993); Emily Meierding, The Oil Wars Myth: Petroleum and the Causes of International Conflict (Ithaca, NY: Cornell University Press, 2020).

[80] Lawrence Freedman and Efraim Karsh, The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order (Princeton, NJ: Princeton University Press, 1993); Charles Tripp, A History of Iraq (Cambridge: Cambridge University Press, 2007).

[81] Lawrence Freedman and Efraim Karsh, The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order (Princeton, NJ: Princeton University Press, 1993); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

[82] Emily Meierding, The Oil Wars Myth: Petroleum and the Causes of International Conflict (Ithaca, NY: Cornell University Press, 2020); Jeff D. Colgan, Petro-Aggression: When Oil Causes War (Cambridge: Cambridge University Press, 2013).

The environmental consequences were also severe. During the retreat from Kuwait, Iraqi forces set fire to hundreds of Kuwaiti oil wells and released oil into the Gulf. UNEP and the United Nations Compensation Commission treated the episode as a major case of wartime environmental damage. Estimates vary across sources, but the destruction of oil wells and large-scale contamination became symbols of fossil infrastructure as both military target and ecological hazard.[83]

This case therefore illustrates three pathways at once:

1. Oil revenue and production disputes can contribute to interstate tension.
2. Control over oil-rich territory can affect strategic calculations and external intervention.
3. Fossil fuel infrastructure can produce environmental damage on a large scale when deliberately destroyed during war.

The Gulf War also reinforced the centrality of United States and allied military presence in the Gulf. Protecting oil flows, deterring regional domination and maintaining access to global markets became part of post-war security architecture. The war did not create the strategic importance of Gulf oil, but it reaffirmed it.[84]

For this White Paper, Iraq's invasion of Kuwait is a cautionary example. It shows that oil matters most as part of a wider strategic system. Revenue, debt, production levels, territorial claims, regime security and external intervention interacted. The analytical task is to identify where fossil fuels materially altered incentives and outcomes without reducing the entire conflict to a single resource explanation.

2.8 Lessons from the twentieth century

The twentieth century established the core relationship between fossil fuels and modern security. Coal powered the early industrial war system. Oil transformed naval power, mechanised warfare, aviation and global logistics. Gas later became central to electricity, heating and industrial systems. Across these transitions, fossil fuels repeatedly shaped the capacity of states to mobilise, fight, coerce and recover.[85]

Several lessons emerge.

The first lesson is that energy systems shape military capability. The move from coal to oil increased range, speed, flexibility and efficiency. Oil-powered vehicles and aircraft

[83] United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009).

[84] Lawrence Freedman and Efraim Karsh, The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order (Princeton, NJ: Princeton University Press, 1993); David S. Painter, Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954 (Baltimore, MD: Johns Hopkins University Press, 1986).

[85] Vaclav Smil, Energy and Civilization: A History (Cambridge, MA: MIT Press, 2017); Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991).

transformed the battlefield. Fuel supply became a condition of operational tempo. A military that lacks energy cannot use its equipment effectively.

The second lesson is that energy dependence creates strategic exposure. Britain's move to oil improved naval power but created dependence on overseas supplies. Industrial states dependent on imported oil became vulnerable to embargo and price shocks. Pipeline gas later reproduced similar vulnerabilities in a different form.

The third lesson is that fossil fuel infrastructure becomes a target in war. Refineries, storage facilities, oilfields, tankers, ports and pipelines are economically valuable and militarily relevant. Attacking them can reduce revenue, disrupt logistics, create public pressure and damage the environment.

The fourth lesson is that fossil fuel revenues can sustain conflict. Oil income can support military spending, arms purchases, patronage and regime survival. This does not mean that oil automatically causes aggression, but it can increase the capacity of states or armed groups to continue fighting.

The fifth lesson is that fossil fuel coercion works through both supply and expectation. The 1973–74 embargo caused physical disruption, but it also altered expectations, prices and policy. Modern energy coercion operates similarly: threats, uncertainty and market psychology can amplify the effect of limited physical disruption.

The sixth lesson is that fossil fuel crises produce institutions. The IEA was created in response to the 1973–74 oil crisis. Strategic petroleum reserves, emergency-sharing arrangements and energy-security doctrines emerged because importers recognised their vulnerability. Contemporary European policy after 2022 follows the same pattern: crisis produced institutional adjustment.

The seventh lesson is that environmental consequences are integral to fossil fuel conflict. The burning of Kuwaiti oil wells, attacks on tankers, oil spills and refinery damage show that fossil infrastructure can produce long-term ecological harm when war reaches energy systems.[86]

These lessons are not historical curiosities. They inform contemporary policy. Europe's dependence on Russian gas before 2022 repeated an older pattern of strategic exposure. Red Sea attacks revived concern over maritime chokepoints. The sabotage of Nord Stream revived concern over undersea infrastructure. Russia's fossil fuel revenue during the war against Ukraine revived the question of how energy exports finance aggression. The current

[86] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005.

transition to renewable energy raises an older question in a new form: how can states gain energy advantages without creating new strategic dependencies?[87]

Conflict / period	Main fossil-fuel dimension	Role of fossil fuels	Illustrative impact	Overall classification
First World War / interwar transition	Shift from coal to oil in naval and military power	Strategic fuel transition	Increased importance of secure oil supply for modern warfare	Structural driver
Second World War	Oil supply and fuel access	Strategic objective and military constraint	Oilfields, refineries and supply lines became major military targets	Strategic objective
1973–74 oil embargo	Deliberate supply restriction by Arab producers	Instrument of coercion	Demonstrated that energy exports could be used as political leverage	Coercion
Iran-Iraq War (1980–88)	Tanker traffic and attacks on oil infrastructure	Chokepoint and infrastructure vulnerability	Threats to Gulf exports increased strategic risk and market instability	Conflict multiplier
Iraq's invasion of Kuwait (1990–91)	Oil reserves, debts and production disputes	Resource-related strategic driver	Control of Kuwaiti reserves became central to the crisis	Partial direct cause
1991 Gulf War aftermath	Burning Kuwaiti oil wells and spills	Environmental consequence	Massive ecological and economic damage after retreating Iraqi forces set wells on fire	Environmental consequence

Table 2. Fossil fuels in selected twentieth-century conflicts

2.9 Fossil fuels as drivers, enablers and strategic objectives

The history reviewed in this chapter supports a differentiated understanding of fossil fuels in conflict. Fossil fuels can act as drivers, enablers and strategic objectives, but they do not perform the same role in every case.[88]

As drivers, fossil fuels may contribute to disputes over territory, revenue, production quotas or transit routes. Iraq's confrontation with Kuwait involved oil pricing, production and field-related grievances, alongside other political and strategic factors. Offshore gas disputes in other regions may similarly interact with sovereignty claims and maritime boundaries.

As enablers, fossil fuels provide revenue and operational capacity. Oil can finance military expenditure, arms procurement, patronage and internal security structures. Fuel supply

[87] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022.

[88] Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005); Michael L. Ross, The Oil Curse: How Petroleum Wealth Shapes the Development of Nations (Princeton, NJ: Princeton University Press, 2012).

enables battlefield mobility. Refineries and storage systems sustain operations. Without fuel, modern military systems lose much of their effectiveness.

As strategic objectives, fossil fuel assets may be captured, defended, sabotaged or protected. Oilfields, refineries, ports and pipelines can become military objectives because they affect revenue, logistics and bargaining power. In the Second World War, access to oil shaped major strategic decisions. In the Gulf War, oil-rich territory and export capacity were central to the stakes. In modern conflicts, energy infrastructure remains a target because it supports the state and affects civilian resilience.[89]

As instruments of coercion, fossil fuels can be used to pressure dependent states. The 1973–74 embargo demonstrated this at global scale. Russia's later use of gas against Europe demonstrated the same logic in a pipeline-dependent regional context.

As environmental hazards, fossil fuel systems can magnify the damage of war. Burning wells, damaged refineries, oil spills, methane releases and contaminated land turn energy infrastructure into a source of long-term public-health and ecological harm.

This differentiated framework is important because it allows policy to be precise. A sanctions policy aimed at war finance is different from a maritime-security policy aimed at chokepoints. A transition policy aimed at reducing gas dependence is different from a reconstruction policy aimed at polluted oilfields. A critical infrastructure policy aimed at pipelines and cables is different from an environmental accountability policy aimed at spills and emissions. The common link is fossil fuel dependence, but the mechanisms differ.[90]

The twentieth century therefore supplies the historical foundation for the White Paper's wider argument. Fossil fuels have not merely accompanied modern conflict. They have shaped the conditions under which states build power, project force, exert pressure and absorb shocks. The strategic case for reducing fossil fuel dependence begins with this history: oil, gas and coal are not only fuels. They are systems of power, revenue, coercion and vulnerability.

[89] Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge: Cambridge University Press, 1977); Richard Overy, *Why the Allies Won* (London: Jonathan Cape, 1995); Lawrence Freedman and Efraim Karsh, *The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order* (Princeton, NJ: Princeton University Press, 1993).

[90] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Emily Meierding, *The Oil Wars Myth: Petroleum and the Causes of International Conflict* (Ithaca, NY: Cornell University Press, 2020); United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009).

Chapter 3

The Political Economy of Fossil Fuel Dependence

3.1 Fossil fuel rents and state power

Fossil fuels shape politics because they generate rents. In political economy, a rent is income derived not primarily from broad-based productive activity, but from control over a scarce asset. Oil, gas and coal reserves are especially significant because they can generate large export revenues, foreign currency earnings and fiscal income for the state. Where fossil fuel rents dominate the economy, control over the state often means control over the principal source of national wealth.[91]

This distinguishes fossil fuel economies from more diversified economies. In a diversified economy, governments usually depend on taxation across households, companies and sectors. That dependence creates pressure for accountability, administrative capacity and some degree of negotiation between state and society. In rentier economies, by contrast, the state may obtain a large share of revenue externally through hydrocarbon exports. This can reduce the need for domestic taxation and weaken the bargaining relationship between citizens and government.[92]

The result is not automatic authoritarianism, nor inevitable instability. Some fossil fuel-exporting states have maintained high levels of administrative capacity, public investment and social stability. Others have experienced corruption, elite competition, repression, patronage and conflict. The political effect of fossil fuel rents depends on institutions, leadership, public finance, social structure, external alliances, price cycles and the degree of economic diversification. However, the recurring pattern is clear enough to matter for security policy: where fossil fuel rents are large, concentrated and weakly governed, they can reinforce political systems that are less accountable, more coercive and more vulnerable to violent competition.[93]

Hydrocarbon rents strengthen state power in several ways:

1. They provide revenue that can be spent without direct taxation. This allows governments to finance public salaries, subsidies, security forces, infrastructure projects and patronage networks. Such spending can buy loyalty and reduce pressure for reform.[94]

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[91] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997).

[92] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); Giacomo Luciani, 'Allocation vs Production States: A Theoretical Framework', in Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987).

[93] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Michael L. Ross, 'Does Oil Hinder Democracy?', *World Politics*, vol. 53, no. 3, 2001, pp. 325–361.

[94] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997).

2. Fossil fuel rents provide foreign exchange. Oil and gas exports are usually priced and traded internationally, often in dollars. This gives producer states access to hard currency that can be used to buy weapons, technology, food imports, strategic goods or political support.[95]
3. Rents increase the value of state capture. If control of the government means control of oil revenue, the stakes of political competition rise. Elections, coups, militia competition and elite struggles can become more intense because the prize is not merely office but command over national income.[96]
4. Rents can weaken non-oil sectors. A large hydrocarbon sector may raise the exchange rate, distort labour markets, concentrate investment and reduce incentives to build manufacturing, agriculture or knowledge-based industries. This is often described as part of the resource curse or "Dutch disease".[97]
5. Fossil fuel infrastructure is territorially specific. Oilfields, gas fields, pipelines, terminals and refineries are located in particular regions. If local communities see little benefit while bearing environmental costs, grievances can grow. Where state authority is weak, armed actors may compete to control these assets.[98]

These mechanisms matter for the central argument of this White Paper. Fossil fuel dependence is not only a question of supply. It is also a question of political structure. Producer states may use hydrocarbon rents to build military power, sustain authoritarian governance or finance foreign-policy ambitions. Importing states may become exposed to these regimes because they depend on their exports. The political economy of fossil fuels therefore links domestic governance in producer states with external vulnerability in consumer states.[99]

3.2 The resource curse: evidence and limits

The "resource curse" refers to the argument that countries rich in natural resources often experience weaker governance, slower diversification, higher corruption and greater conflict risk than might be expected from their wealth. The term is widely used, but it must be applied carefully. Not all resource-rich states are poorly governed. Not all fossil fuel exporters experience war. Some states have used resource income to build infrastructure, education systems, sovereign wealth funds and stable public institutions.[100]

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[95] Daniel Yergin, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon & Schuster, 1991); David S. Painter, Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954 (Baltimore, MD: Johns Hopkins University Press, 1986).

[96] Paul Collier and Anke Hoeffler, 'Greed and Grievance in Civil War', Oxford Economic Papers, vol. 56, no. 4, 2004, pp. 563–595; Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005).

[97] Richard M. Auty, Sustaining Development in Mineral Economies: The Resource Curse Thesis (London: Routledge, 1993); World Bank, Diversified Development: Making the Most of Natural Resources in Eurasia (Washington, DC: World Bank, 2014).

[98] Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005); United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011).

[99] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013).

[100] Richard M. Auty, Sustaining Development in Mineral Economies: The Resource Curse Thesis (London: Routledge, 1993); Michael L. Ross, The Oil Curse: How Petroleum Wealth Shapes the Development of Nations (Princeton, NJ: Princeton

The resource curse should therefore be understood as a set of risks rather than a universal law. The question is not whether oil, gas or coal automatically produce negative outcomes. The question is under what conditions fossil fuel wealth becomes politically destabilising.[101]

Several mechanisms are relevant.

The first is the taxation effect. Governments that receive large external rents may rely less on domestic taxation. Lower reliance on taxation may reduce the demand for representation and accountability. If citizens do not directly fund the state through broad taxation, the state may feel less pressure to respond to citizens' preferences.[102]

The second is the spending effect. Resource revenues can be used to fund subsidies, public employment and patronage. This can stabilise a regime in the short term, but it can also make the political system dependent on continued high revenues. When prices fall, governments may struggle to maintain spending and social peace.[103]

The third is the repression effect. Hydrocarbon rents can finance internal security forces, intelligence services and military units. This can allow governments to suppress opposition more effectively.[104]

The fourth is the corruption effect. Large revenues flowing through a concentrated sector can create opportunities for elite capture, opaque contracting, off-budget spending and illicit enrichment.[105]

The fifth is the conflict effect. Armed groups may seek to control resource sites, smuggling routes or export terminals. Local communities may rebel against unequal distribution or environmental harm. Elites may fight over access to revenue.[106]

The sixth is the diversification effect. Reliance on oil or gas can discourage investment in other sectors. Governments may postpone reforms while revenue is abundant. Over time, the economy becomes less adaptable.[107]

University Press, 2012); World Bank, The Changing Wealth of Nations 2021: Managing Assets for the Future (Washington, DC: World Bank, 2021).

[101] Michael L. Ross, 'What Have We Learned about the Resource Curse?', Annual Review of Political Science, vol. 18, 2015, pp. 239–259.

[102] Ibid.

[103] Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997); International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016).

[104] Michael L. Ross, 'Does Oil Hinder Democracy?', *World Politics*, vol. 53, no. 3, 2001, pp. 325–361; Benjamin Smith, 'Oil Wealth and Regime Survival in the Developing World, 1960–1999', *American Journal of Political Science*, vol. 48, no. 2, 2004, pp. 232–246.

[105] Organisation for Economic Co-operation and Development, *Corruption in the Extractive Value Chain: Typology of Risks, Mitigation Measures and Incentives* (Paris: OECD Publishing, 2016); Natural Resource Governance Institute, *2021 Resource Governance Index* (New York: NRGI, 2021).

[106] Paul Collier and Anke Hoeffler, 'Greed and Grievance in Civil War', *Oxford Economic Papers*, vol. 56, no. 4, 2004, pp. 563–595; Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

[107] Richard M. Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 1993); World Bank, *Diversified Development: Making the Most of Natural Resources in Eurasia* (Washington, DC: World Bank, 2014).

The academic literature does not support every version of the resource curse thesis equally. The evidence is stronger for links between oil wealth, authoritarian durability and corruption than for a simple claim that oil always causes civil war. Some research finds that petroleum wealth can increase conflict risk under certain conditions, especially where institutions are weak, resources are located in marginalised regions, or armed groups can access production and trade networks. Other research questions broad claims and emphasises variation between countries.[108]

The resource curse also applies differently to oil, gas and coal. Oil is highly liquid, internationally traded and often generates large export revenues. It can be smuggled, sold at discount, refined locally or moved by tanker and truck. Gas is more infrastructure-dependent, particularly where pipeline exports dominate. This can make gas less easily captured by small armed groups, but more useful for state-level coercion through pipeline politics. Coal usually generates lower geopolitical leverage than oil or gas, but it can still matter in electricity, steel production and regional political economies.[109]

The resource curse framework is useful only when applied with precision and with attention to each country's political and historical context.

3.3 Rentier-state economics and weak accountability

A rentier state is a state that receives a substantial share of its revenue from external rents rather than domestic taxation. Oil and gas exporters are the clearest examples. In such systems, the state distributes wealth generated from resource exports, rather than relying mainly on a broad domestic tax base.[110]

This structure affects accountability. In many political systems, taxation creates bargaining. Citizens and businesses pay taxes and demand services, representation, rule of law and limits on arbitrary power. Where the state depends heavily on taxing society, it must develop institutions for revenue collection, economic management and public consent. In rentier systems, that relationship is weaker. The state can use external revenue to fund itself and distribute benefits without building the same level of domestic accountability:[111]

1. It can strengthen executive power. Control over hydrocarbon revenue usually sits at the centre of the state. Presidents, monarchs, ruling parties or military elites may dominate national oil companies, sovereign wealth funds, licensing decisions and public expenditure.

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[108] Michael L. Ross, 'What Have We Learned about the Resource Curse?', *Annual Review of Political Science*, vol. 18, 2015, pp. 239–259; Matthias Basedau and Jann Lay, 'Resource Curse or Rentier Peace? The Ambiguous Effects of Oil Wealth and Oil Dependence on Violent Conflict', *Journal of Peace Research*, vol. 46, no. 6, 2009, pp. 757–776; Stephen Haber and Victor Menaldo, 'Do Natural Resources Fuel Authoritarianism? A Reappraisal of the Resource Curse', *American Political Science Review*, vol. 105, no. 1, 2011, pp. 1–26.

[109] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[110] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); Giacomo Luciani, 'Allocation vs Production States: A Theoretical Framework', in Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987).

[111] Michael L. Ross, 'Does Oil Hinder Democracy?', *World Politics*, vol. 53, no. 3, 2001, pp. 325–361; Daron Acemoglu and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity and Poverty* (London: Profile Books, 2012).

2. It can weaken parliaments and oversight institutions. If the main revenue stream comes from oil or gas exports controlled by the executive, budget scrutiny may become less effective. Off-budget funds, opaque contracts and security spending can reduce transparency.[112]
3. It can create patronage politics. Governments may distribute jobs, subsidies, contracts, land, import licences or direct payments to maintain loyalty. Political support becomes tied to access to state-controlled rents.
4. It can reduce incentives for economic reform. High oil prices may allow governments to postpone diversification, maintain inefficient subsidies and avoid difficult fiscal choices.[113]
5. It can generate instability when rents decline. If the political system is built around distribution, a fall in revenue can expose weak institutions, unemployment, debt, public anger and elite competition.[114]

Rentier stability can be brittle when prices fall, sanctions restrict exports or production declines.[115]

The link to security is direct. A rentier state with large hydrocarbon revenues may finance military modernisation, foreign interventions, proxy networks or internal repression. Importing states that depend on such a producer may indirectly strengthen that system. If the producer later uses energy as leverage, importers face both supply risk and political exposure.[116]

Russia illustrates several aspects of this problem. Hydrocarbon revenues have been central to the Russian state's fiscal and geopolitical capacity. Oil and gas exports have provided revenue, foreign exchange and leverage over import-dependent customers. The Russian state's ownership and influence over energy companies have allowed energy policy to operate as part of wider foreign policy. Europe's pre-2022 dependence on Russian gas therefore linked European energy security to the political economy of a producer state whose strategic aims became directly hostile to European security.[117]

Iran demonstrates another variation. Oil revenues, despite sanctions pressure, have historically supported state expenditure, security structures and regional policy. Sanctions have constrained revenue, but they have also encouraged evasion networks, shadow trade

[112] Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997); Natural Resource Governance Institute, *2021 Resource Governance Index* (New York: NRGI, 2021).

[113] International Monetary Fund, Economic Diversification in Oil-Exporting Arab Countries (Washington, DC: IMF, 2016); World Bank, Diversified Development: Making the Most of Natural Resources in Eurasia (Washington, DC: World Bank, 2014).

[114] World Bank, Commodity Markets Outlook (Washington, DC: World Bank, April 2026); International Monetary Fund, World Economic Outlook: A Critical Juncture amid Policy Shifts (Washington, DC: IMF, April 2026).

[115] Benjamin Smith, 'Oil Wealth and Regime Survival in the Developing World, 1960–1999', American Journal of Political Science, vol. 48, no. 2, 2004, pp. 232–246; Michael L. Ross, The Oil Curse: How Petroleum Wealth Shapes the Development of Nations (Princeton, NJ: Princeton University Press, 2012).

[116] Jeff D. Colgan, Petro-Aggression: When Oil Causes War (Cambridge: Cambridge University Press, 2013); Stockholm International Peace Research Institute, Trends in World Military Expenditure, 2025, SIPRI Fact Sheet, Stockholm, April 2026.

[117] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

and alternative financial channels. The issue is not simply whether oil revenue is high or low, but how the state adapts its political and security apparatus around it.[118]

Gulf monarchies show a more complex picture. Hydrocarbon rents have supported high state capacity, welfare systems, public investment and sovereign wealth accumulation in several cases. At the same time, dependence on hydrocarbon revenue has shaped social contracts, labour markets, defence spending and external alliances. These states demonstrate that rentier systems are not uniform, but they also show how fossil fuel revenues can define state-society relations and security policy.[119]

Rentier-state economics therefore matters because it explains how fossil fuels can become embedded in governance. Energy exports are not separate from politics. They affect taxation, representation, public spending, military capacity, elite power and foreign policy. For energy importers, this means that buying fossil fuels is not only a market transaction. It can have strategic consequences.

3.4 Hydrocarbon revenue, patronage and corruption

Hydrocarbon revenue is particularly vulnerable to corruption because it is large, concentrated and technically complex. Oil and gas projects involve concessions, licences, production-sharing agreements, infrastructure contracts, shipping arrangements, commodity traders, state-owned enterprises and financial intermediaries. Many of these areas require specialised knowledge and are difficult for the public to scrutinise.[120]

Corruption in fossil fuel economies can take several forms.

The first is licensing corruption. Political elites may allocate exploration or production rights to favoured companies, associates or foreign partners in exchange for payments, political support or personal benefit.

The second is procurement corruption. Energy infrastructure requires large contracts for pipelines, refineries, ports, drilling services, security and transport. These contracts can be inflated or directed towards connected firms.

The third is revenue diversion. Funds from oil and gas sales may be moved into off-budget accounts, sovereign funds lacking transparency, military budgets, private accounts or patronage networks.

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[118] U.S. Energy Information Administration, *Country Analysis Brief: Iran* (Washington, DC: EIA, 2024); International Monetary Fund, *Islamic Republic of Iran: 2025 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for the Islamic Republic of Iran*, IMF Country Report No. 25/124 (Washington, DC: IMF, 2025).

[119] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016).

[120] Natural Resource Governance Institute, *2021 Resource Governance Index* (New York: NRGI, 2021); Extractive Industries Transparency Initiative, *EITI Standard 2023* (Oslo: EITI International Secretariat, 2023).

The fourth is commodity-trading opacity. Oil cargoes can be sold through intermediaries, often with complex pricing, discounts and commissions. This creates opportunities for hidden profits.[121]

The fifth is smuggling and theft. In weak states or conflict zones, crude oil, refined products and fuel can be stolen, diverted or sold through illicit networks.

The sixth is political finance. Hydrocarbon rents can fund parties, media networks, lobbying, disinformation or foreign influence operations.[122]

Corruption matters for security because it weakens institutions. A state that loses revenue through corruption has fewer resources for public services and more incentives for elite competition. Corrupt security forces may become predatory. Public distrust may grow. Local communities near extraction sites may see environmental damage without fair compensation. Armed groups may claim to fight corruption while entering the same illicit economy.[123]

Corruption also matters for sanctions. Where fossil trade is opaque, sanctioned states can use intermediaries, reflagged vessels, ship-to-ship transfers, false documentation, insurance loopholes and third-country refiners to preserve revenue. The more complex the trading system, the harder it is to enforce restrictions. Oil is particularly difficult because it is globally traded, fungible and often transported by maritime networks that can obscure origin.[124]

In conflict environments, hydrocarbon corruption often merges with armed competition. Libya is a relevant case. Oil terminals, export revenues and control of the National Oil Corporation have been central to the country's post-2011 fragmentation. Armed groups and political factions have used control over oil infrastructure to bargain, pressure rivals or extract concessions. The result has been a repeated cycle of blockades, output disruption and fiscal uncertainty.[125]

The Niger Delta offers another model. Oil theft, illegal refining, sabotage, environmental damage and local militancy have interacted over many years. Some actors present themselves as defenders of local rights or environmental justice; others participate in illicit

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[121] Organisation for Economic Co-operation and Development, *Corruption in the Extractive Value Chain: Typology of Risks, Mitigation Measures and Incentives* (Paris: OECD Publishing, 2016); Natural Resource Governance Institute, *Twelve Red Flags: Corruption Risks in the Award of Extractive Sector Licences and Contracts* (New York: NRGI, 2017).

[122] Organisation for Economic Co-operation and Development, *Corruption in the Extractive Value Chain: Typology of Risks, Mitigation Measures and Incentives* (Paris: OECD Publishing, 2016); Financial Action Task Force, *Money Laundering from Environmental Crime* (Paris: FATF, 2021).

[123] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); Human Rights Watch, *The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Oil Producing Communities* (New York: Human Rights Watch, 1999).

[124] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[125] United Nations Security Council, Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011), UN Doc. S/2024/914, 13 December 2024; Wolfram Lacher, Libya's Fragmentation: Structure and Process in Violent Conflict (London: I.B. Tauris, 2020).

extraction and protection economies. Weak governance, pollution and corruption reinforce each other.[126]

Contract disclosure, beneficial ownership rules, revenue reporting, anti-money-laundering enforcement and commodity-trade transparency should be treated as energy-security measures, not only governance reforms.[127]

3.5 Fossil fuel wealth and authoritarian resilience

Fossil fuel wealth can help authoritarian systems endure. This does not mean that every fossil fuel exporter is authoritarian, nor that fossil fuels alone explain regime type. It means that hydrocarbon rents can provide tools that make authoritarian rule easier to sustain.[128]

The first tool is fiscal autonomy. Governments with large oil and gas revenues may rely less on consent-based taxation. They can finance the state without building broad accountability. This weakens one of the historical pressures for representation.

The second tool is distributive capacity. Hydrocarbon revenue can fund subsidies, public jobs, housing, infrastructure, pensions and direct transfers. These benefits may reduce pressure for political change, especially where the state controls access to employment and welfare.

The third tool is coercive capacity. Oil and gas income can finance police, intelligence services, elite military units, surveillance technology and internal security systems. Repression becomes more affordable.[129]

The fourth tool is elite management. Rents can be distributed among powerful families, military officers, regional leaders, business networks and political loyalists. This can prevent elite splits, at least while revenue remains sufficient.

The fifth tool is external influence. Hydrocarbon exporters may use energy contracts, investment, sovereign wealth funds, arms purchases or diplomatic support to build foreign partnerships that reduce external pressure for reform.[130]

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[126] United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011); Cyril Obi and Siri Aas Rustad, eds., Oil and Insurgency in the Niger Delta: Managing the Coplex Politics of Petro-Violence (London: Zed Books, 2011).

[127] Extractive Industries Transparency Initiative, EITI Standard 2023 (Oslo: EITI International Secretariat, 2023); Organisation for Economic Co-operation and Development, Corruption in the Extractive Value Chain: Typology of Risks, Mitigation Measures and Incentives (Paris: OECD Publishing, 2016); Financial Action Task Force, Money Laundering from Environmental Crime (Paris: FATF, 2021).

[128] Michael L. Ross, ‘Does Oil Hinder Democracy?’, *World Politics*, vol. 53, no. 3, 2001, pp. 325–361; Benjamin Smith, ‘Oil Wealth and Regime Survival in the Developing World, 1960–1999’, *American Journal of Political Science*, vol. 48, no. 2, 2004, pp. 232–246.

[129] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013).

[130] International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026); Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026.

Russia again illustrates the issue in European security terms. Energy revenue helped sustain state capacity, military modernisation and foreign policy ambition. European dependence on Russian gas gave Moscow leverage over parts of the European energy system. The full-scale invasion of Ukraine demonstrated the risks of allowing a major security adversary to remain a central energy supplier.[131]

Iran illustrates a different version. Oil revenue, even under sanctions constraints, has historically contributed to state resilience and regional influence. Sanctions pressure has reduced revenue at times, but it has also produced adaptive networks, informal trade and alternative routes. The resilience of such systems depends not only on revenue volume, but on control over distribution and the ability to absorb economic hardship.[132]

Venezuela offers a cautionary example of how fossil wealth can coexist with institutional collapse. Oil dependence provided revenue for years, but weak diversification, politicised management, corruption, sanctions, price shocks and institutional degradation contributed to severe economic crisis. The case shows that fossil wealth can support a regime while undermining the long-term capacity of the state.[133]

Gulf monarchies show that hydrocarbon wealth can also support high state capacity, infrastructure development and external influence. Their experience cautions against crude generalisations. Some have used sovereign wealth funds and diversification strategies to prepare for a post-oil future. However, the basic rentier structure remains strategically relevant: hydrocarbon revenues shape domestic political bargains, defence procurement, regional diplomacy and external partnerships.[134]

For Europe and NATO, the security implication is not that all fossil exporters should be treated identically. The implication is that fossil fuel dependence should be assessed through a political-risk lens. Who controls the revenue? How is it spent? Does it finance aggression, repression or destabilising regional activity? Does the supplier have a record of coercion? Can the importer reduce exposure? These questions should be part of energy procurement and foreign policy.

3.6 Military spending and internal security structures

Fossil fuel revenues can support military expenditure and internal security structures. The relationship is not automatic, but it is strategically significant. Hydrocarbon income can

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[131] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

[132] U.S. Energy Information Administration, Country Analysis Brief: Iran (Washington, DC: EIA, 2024); International Monetary Fund, Islamic Republic of Iran: 2025 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for the Islamic Republic of Iran, IMF Country Report No. 25/124 (Washington, DC: IMF, 2025).

[133] International Monetary Fund, *Venezuela: Staff Report for the 2004 Article IV Consultation*, IMF Country Report No. 05/23 (Washington, DC: IMF, 2005); U.S. Energy Information Administration, *Country Analysis Brief: Venezuela* (Washington, DC: EIA, 2024).

[134] International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016); International Renewable Energy Agency, *Renewable Energy Market Analysis: GCC 2019* (Abu Dhabi: IRENA, 2019).

provide the fiscal base for arms procurement, defence-industrial investment, intelligence services, elite units, paramilitary forces and foreign military operations.[135]

Military spending requires sustained revenue. Oil and gas exports can provide that revenue, particularly when prices are high. Producer states may use hydrocarbon income to purchase advanced weapons, fund domestic military industries, maintain large security forces or support proxy groups. In some cases, fossil revenue helps compensate for weaknesses in the broader economy.[136]

The relationship between fossil revenue and military spending has several pathways:

1. Hydrocarbon revenue increases fiscal space. A state with large energy exports may be able to spend more on defence than its non-energy economy would otherwise support.
2. Fossil exports provide hard currency. Weapons imports, advanced technology and military components often require foreign currency. Oil and gas sales can supply it.
3. Energy revenue can protect defence spending during crisis. A regime may cut social spending, investment or imports before reducing military expenditure if it sees security forces as essential to survival.
4. Energy companies and infrastructure may be integrated into national security policy. State-owned energy firms can support strategic projects, foreign influence, logistics and intelligence relationships.
5. Domestic security services may be funded to protect extraction sites, suppress local unrest or secure pipelines and terminals.[137]

Russia’s war against Ukraine has kept this issue central. Russian fossil fuel exports continued to generate significant revenue after the invasion, despite sanctions, price caps and reduced European imports. These revenues cannot be equated directly with military spending, but they form part of the fiscal environment that sustains the Russian state. Sanctions aimed at oil, petroleum products, coal, LNG infrastructure, shipping services and price-cap enforcement reflect the view that fossil revenues can support aggression.[138]

Iran’s regional policy also illustrates the connection between oil revenue, sanctions evasion and security activity. While sanctions restrict official exports and revenue, they also create incentives for opaque trade, discounted sales and networks that can fund state priorities.

[135] Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[136] Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013); David S. Painter, *Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954* (Baltimore, MD: Johns Hopkins University Press, 1986).

[137] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997).

[138] Centre for Research on Energy and Clean Air, *Financing Putin’s War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026); Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; European Council, ‘EU Sanctions against Russia Explained’, European Council / Council of the European Union, accessed 4 June 2026.

The link between oil revenue and regional proxy support is difficult to quantify precisely, but it remains a major concern in Western sanctions policy.[139]

In several Gulf states, hydrocarbon wealth has supported high levels of defence procurement. This does not imply that such spending is aggressive. States in a volatile region have security concerns, alliance commitments and deterrence requirements. However, the scale of spending is linked to the fiscal capacity provided by oil and gas.[140]

Internal security is equally important. In rentier systems, coercive institutions often protect both regime survival and energy infrastructure. Oilfields, pipelines and ports may be guarded by military or paramilitary units. Security forces may suppress protests around extraction sites. Where communities experience pollution without adequate compensation, the presence of security forces can turn environmental grievance into political confrontation.[141]

For policy, the key issue is whether fossil revenues support destabilising behaviour. Not all military spending funded by oil is illegitimate; states have the right to defend themselves. The problem arises where hydrocarbon revenue finances aggression, repression, proxy warfare or coercion against importers. In such cases, reducing fossil revenue becomes a security policy objective.

This is why sanctions, price caps, shipping restrictions and energy diversification are linked. If fossil revenues sustain military capacity, then reducing those revenues can limit a hostile state's ability to wage war. However, such measures must be designed carefully. Energy sanctions can raise global prices if poorly calibrated, potentially offsetting revenue losses or harming importers. Effective policy requires co-ordination, enforcement, market analysis and measures against circumvention.[142]

3.7 Import dependence and exposure to external pressure

The political economy of fossil fuel dependence concerns importers as well as exporters. Import-dependent states may be wealthy, democratic and institutionally strong, but they can still be strategically exposed if their energy system relies on suppliers with conflicting interests.[143]

Import dependence creates vulnerability through several channels.

[139] U.S. Energy Information Administration, *Country Analysis Brief: Iran* (Washington, DC: EIA, 2024); United States Department of the Treasury, Office of Foreign Assets Control, 'Iran Sanctions', accessed 4 June 2026.

[140] Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[141] United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011); Human Rights Watch, The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Oil Producing Communities (New York: Human Rights Watch, 1999).

[142] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, Price Cap Coalition Guidance on Russian Oil, Washington, DC, accessed 4 June 2026; Bruegel, analysis on the Russian oil price cap and sanctions enforcement, accessed 4 June 2026.

[143] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy*, vol. 75, 2014, pp. 415–421.

The first is supply interruption. A producer may cut exports, reduce volumes, delay deliveries or use technical pretexts to create pressure. This is particularly relevant for pipeline gas, where physical alternatives may be limited.

The second is price exposure. Even if supply continues, price increases can create economic and political stress. Oil and gas prices affect household bills, inflation, industrial competitiveness and government budgets.

The third is contract leverage. Long-term contracts may include pricing formulas, take-or-pay obligations, destination clauses, arbitration risks or political conditions that limit flexibility.

The fourth is infrastructure lock-in. Pipelines, LNG terminals, refineries and storage facilities create sunk costs. Governments may hesitate to shift policy if doing so strands expensive assets.

The fifth is foreign influence. Supplier states may use energy relationships to cultivate political allies, fund lobbying, acquire infrastructure or influence public debate.

The sixth is crisis constraint. During military or diplomatic crises, import dependence can limit the willingness of states to impose sanctions, support allies or confront suppliers.[144]

Europe's pre-2022 dependence on Russian gas demonstrates these channels. Several Member States relied heavily on Russian pipeline gas for heating, electricity and industry. Infrastructure was built around east-west flows. Storage ownership and market behaviour became matters of concern. When Russia reduced supplies and demanded payment changes, European states faced price spikes, emergency procurement, industrial pressure and public anxiety.[145]

The EU response reduced vulnerability but did not eliminate fossil dependence. LNG diversification increased flexibility, but LNG is tied to global markets, shipping routes and competition with Asian buyers. Oil remains globally priced and vulnerable to chokepoints. Petroleum products still underpin transport and parts of industry. This means that the strategic lesson is not simply "do not buy from Russia". It is "do not allow any essential energy system to become dependent on a narrow set of coercible external supplies".[146]

Import dependence also affects foreign policy beyond Europe. Many developing countries are highly exposed to oil-price shocks because fuel imports consume a large share of foreign exchange. Price spikes can create balance-of-payments crises, subsidy burdens, food

[144] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[145] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[146] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Gas Market Report, Q1 2023* (Paris: IEA, 2023); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

inflation and political unrest. Such states may have limited fiscal capacity to protect households. Energy insecurity can therefore become a development and stability issue.[147]

For NATO, import dependence has military implications. Armed forces require fuel. Defence industries require electricity, gas, steel, chemicals and transport. If civilian energy systems are disrupted, military readiness and production can be affected. Hostile actors may target energy infrastructure precisely because it affects both civilian resilience and defence capacity.[148]

Import dependence should therefore be measured not only by percentage of energy imported, but by strategic substitutability. A state may import a high share of energy but remain resilient if suppliers are diversified, storage is adequate, demand can be reduced, infrastructure is flexible and political relations are stable. Conversely, a lower import share can still be dangerous if one critical sector depends on one hostile supplier.[149]

3.8 Case references: Russia, Iran, Iraq, Libya, Venezuela and Gulf producers

The political economy of fossil fuel dependence varies across cases. This section does not attempt to provide full country studies. Instead, it identifies how selected producer states illustrate different dimensions of fossil fuel politics.

Russia

Russia is the central European security case. Oil and gas revenues have been crucial to the Russian state's fiscal capacity and foreign policy. The state's influence over major energy companies, combined with Europe's historical dependence on Russian gas, allowed energy to become part of a wider strategic relationship.[150]

Before 2022, Russian gas was often defended as a commercially rational supply source. It was pipeline-based, relatively affordable and integrated into European industrial systems. However, this relationship created vulnerability. Russia's ability to reduce flows, exploit contract disputes and generate price uncertainty showed that energy dependence had strategic consequences.[151]

Russia also demonstrates the war-finance problem. Fossil fuel exports continued to provide revenue after the invasion of Ukraine, even as sanctions reduced certain flows. The policy challenge has been to reduce Russian revenue without causing global price spikes that could harm importers or increase Russian earnings through higher prices. This is why sanctions,

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[147] World Bank, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026); International Monetary Fund, *World Economic Outlook* (Washington, DC: IMF, April 2026).

[148] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; NATO, *Strategic Concept 2022* (Brussels: NATO, 2022).

[149] Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy*, vol. 75, 2014, pp. 415–421; International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[150] IEA, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas*; European Commission, *REPowerEU Plan*.

[151] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

price caps, shipping restrictions and enforcement against circumvention have become central to Western strategy.[152]

Iran

Iran illustrates the interaction between oil, sanctions, state resilience and regional security. Oil exports have historically been a major source of revenue. Sanctions have restricted official trade, but Iran has adapted through discounted sales, intermediaries and alternative routes. Oil revenue, even when constrained, remains relevant to fiscal capacity and regional policy.[153]

Iran also sits near the Strait of Hormuz, one of the world's most important energy chokepoints. This gives the country a form of geographic leverage beyond its production capacity. Threats to shipping or tensions in the Gulf can affect global oil markets even without a full blockade. Iran therefore illustrates both revenue-based and route-based dimensions of fossil fuel security.[154]

Iraq

Iraq shows how oil wealth can intersect with state weakness, war and external intervention. Oil revenue is central to the Iraqi state, but the country's modern history includes war, sanctions, invasion, insurgency and institutional fragility. Control of oil revenue has been central to state reconstruction, federal-regional disputes and budget politics.[155]

The 1990 invasion of Kuwait showed how oil pricing, debt, production disputes and territorial ambition could contribute to crisis. Later, after 2003, oil revenue became central to rebuilding state institutions, but also to corruption, patronage and political competition.[156]

Libya

Libya demonstrates the vulnerability of hydrocarbon assets in a fragmented state. Oil exports provide the main source of national revenue, but armed groups and rival authorities have repeatedly contested control over terminals, fields and institutions. Blockades and

[152] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; Oxford Institute for Energy Studies, papers on Gazprom and Russian gas exports.

[153] Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026.

[154] U.S. Energy Information Administration, *Country Analysis Brief: Iran* (Washington, DC: EIA, 2024); International Monetary Fund, *Islamic Republic of Iran: 2025 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for the Islamic Republic of Iran*, IMF Country Report No. 25/124 (Washington, DC: IMF, 2025).

[155] Charles Tripp, A History of Iraq (Cambridge: Cambridge University Press, 2007); International Monetary Fund, Iraq: 2024 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for Iraq, IMF Country Report No. 24/151 (Washington, DC: IMF, 2024).

[156] Lawrence Freedman and Efraim Karsh, The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order (Princeton, NJ: Princeton University Press, 1993); Charles Tripp, A History of Iraq (Cambridge: Cambridge University Press, 2007).

shutdowns have been used as bargaining tools. The result is a political economy in which oil infrastructure is both a national asset and a lever for competing factions.[157]

Libya's case is important because it shows that fossil fuel wealth does not require a strong state to create strategic consequences. In weak states, oil assets can become prizes for militias, bargaining chips in negotiations and sources of external interest.[158]

Venezuela

Venezuela illustrates the long-term risks of mono-export dependence. Oil wealth supported public spending and political projects, but weak diversification, governance failures, corruption, sanctions and production decline contributed to severe economic crisis. The country's experience shows that fossil fuel wealth can mask institutional weakness for a time, but dependence on one commodity exposes the state to price cycles, mismanagement and external pressure.[159]

Venezuela also shows that oil wealth does not guarantee energy-sector competence. Production can collapse where investment, technical capacity and governance deteriorate. Resource abundance is not the same as resilience.[160]

Gulf producers

Gulf producers show that hydrocarbon wealth can also support high state capacity, infrastructure development, sovereign wealth funds and external influence. Their experience cautions against crude versions of the resource-curse argument. At the same time, hydrocarbon rents continue to shape domestic political bargains, defence procurement, regional diplomacy and external partnerships.

3.9 Why political economy matters for security policy

Political economy matters because energy security is not only about volumes, prices and infrastructure. It is also about who controls revenue, how that revenue is used, and what dependencies it creates.[161]

A purely technical approach to energy security might ask whether supply is available, affordable and physically reliable. A political-economy approach asks additional questions. Does the supplier use energy revenue to finance aggression or repression? Is the producer state stable or fragile? Are contracts transparent? Is infrastructure vulnerable to political

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157 United Nations Security Council, Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011), UN Doc. S/2024/914, 13 December 2024; World Bank, Libya Economic Monitor: Spring 2025 (Washington, DC: World Bank, 2025).

158 Wolfram Lacher, Libya's Fragmentation: Structure and Process in Violent Conflict (London: I.B. Tauris, 2020); U.S. Energy Information Administration, Country Analysis Brief: Libya (Washington, DC: EIA, 2024).

159 U.S. Energy Information Administration, *Country Analysis Brief: Venezuela* (Washington, DC: EIA, 2024).

160 U.S. Energy Information Administration, *Country Analysis Brief: Venezuela* (Washington, DC: EIA, 2024); World Bank, *The Changing Wealth of Nations 2021: Managing Assets for the Future* (Washington, DC: World Bank, 2021).

161 Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

manipulation? Can revenue be diverted through corruption or sanctions evasion? Are importers strengthening actors whose strategic objectives conflict with their own?[162]

These questions are now central to European policy. Before 2022, much European energy policy assumed that interdependence with Russia would be manageable. The invasion of Ukraine showed that energy trade can coexist with aggression and may even help finance it. The policy lesson is that energy procurement cannot be separated from strategic assessment.[163]

Political economy also matters for sanctions. If fossil revenue finances war, sanctions should target revenue streams. But sanctions must be calibrated. A crude embargo can raise prices and benefit the exporter if global supply is tight. A price cap can reduce revenue while maintaining supply, but only if enforcement is strong. Restrictions on shipping, insurance, finance and refining must account for evasion. Understanding the political economy of fossil trade is therefore essential to effective sanctions policy.[164]

Political economy also matters for critical minerals. The transition away from fossil fuels will create new supply chains. If Europe ignores governance, concentration and dependency risks in minerals, batteries and clean technology, it could reproduce parts of the fossil fuel problem in another form. The lesson from fossil dependence is not only "move away from oil and gas". It is "do not build strategic systems around opaque, concentrated and coercible dependencies".[165]

For the EU, political economy matters because energy policy intersects with enlargement, neighbourhood policy, development finance, sanctions, trade, industrial strategy and climate diplomacy. The EU cannot build strategic autonomy if it remains dependent on energy or materials controlled by actors willing to exploit that dependence.[166]

The central conclusion of this chapter is that fossil fuel dependence is not only a physical supply issue. It is also a political structure: hydrocarbon rents shape regimes, fund security apparatuses, influence foreign policy, distort economies and expose importers to external pressure.

[162] Natural Resource Governance Institute, *2021 Resource Governance Index* (New York: NRGI, 2021); Extractive Industries Transparency Initiative, *EITI Standard 2023* (Oslo: EITI International Secretariat, 2023).

[163] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022).

[164] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[165] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[166] European Commission, *European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *Global Gateway Strategy*, Brussels, 2021.

Chapter 4

Fossil Fuels as Instruments of Coercion

4.1 Forms of energy weaponisation

Fossil fuels become instruments of coercion when supply, pricing, infrastructure, contracts, transport routes or energy revenues are used to influence the behaviour of another actor. Coercion does not require a total embargo or a formal declaration of economic warfare. It may take the form of threatened disruption, selective supply reduction, manipulation of contractual terms, politically conditioned pricing, control of infrastructure, acquisition of strategic energy assets, or the use of uncertainty to affect markets and public opinion.[167]

Energy coercion depends on asymmetry. It is most effective when one actor controls a resource, route or infrastructure that another actor cannot replace quickly. This is why pipeline gas is particularly vulnerable to weaponisation. A gas pipeline establishes a fixed relationship between producer, transit states and importer. Unlike oil, which is globally traded and can often be rerouted by tanker, pipeline gas creates dependence on a specific supplier, route and infrastructure system. Liquefied natural gas provides more flexibility, but it still depends on terminals, shipping capacity, long-term contracts, global cargo availability and competition between buyers.[168]

Oil is less geographically fixed than pipeline gas, but it remains coercible through embargoes, production decisions, maritime chokepoints, tanker harassment, export licensing, insurance risk and market signalling. Coal is generally less susceptible to direct coercion because its supply chains are more diverse and its transport is relatively flexible. However, coal can still become strategic where it is critical for electricity generation, steel production, industrial resilience or emergency substitution during a gas crisis.[169]

Supply coercion occurs when a producer, transit actor or controlling authority reduces, interrupts or threatens energy deliveries in order to influence another state or political actor. This includes embargoes, pipeline cuts, export restrictions, licensing delays, selective delivery reductions and pressure on particular customers.[170]

Price coercion occurs when a producer, cartel or dominant supplier seeks to influence prices for political purposes, or when discriminatory pricing is used to reward compliant

[167] International Energy Agency, *Energy Security* (Paris: IEA, latest update); Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy*, vol. 75, 2014.

[168] International Energy Agency, *Gas Market Report*, 2022–2025 editions; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated* (Luxembourg: ECA, 2024).

[169] International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[170] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

states and punish resistant ones. It may be difficult to distinguish from market management in some cases, but intent, timing and political signalling are relevant.

Contractual coercion occurs when long-term supply agreements, payment terms, arbitration threats, take-or-pay obligations, destination clauses or currency requirements are used to restrict a customer's freedom of action. Pipeline gas contracts are particularly important because they often combine long duration, physical route dependence and large sunk costs.[171]

Infrastructure coercion occurs when ownership, control or physical routing of pipelines, terminals, ports, refineries, storage facilities, interconnectors or undersea assets is used to create dependency or restrict alternatives. A pipeline may appear to be a commercial project, but it can alter strategic relationships between producer, transit state and importer.

Market coercion occurs when threats, ambiguity or deliberate signalling affect prices, insurance, shipping behaviour and public expectations even before physical supply is interrupted. Energy markets respond to risk. A credible threat to a chokepoint, pipeline or tanker route can raise costs without a formal blockade.[172]

Revenue coercion occurs when fossil fuel income is used to finance military pressure, proxy groups, political networks abroad, disinformation, elite patronage or internal repression. In this form, the coercive effect does not arise from withholding supply, but from converting energy revenue into strategic power.[173]

In practice, these categories often overlap. A supplier may reduce gas flows, create legal disputes over contracts, cite technical problems, encourage market panic, and then exploit the resulting price increase. A state may threaten a chokepoint while also supporting armed groups that target shipping. A government may use energy revenue to fund military operations while continuing to sell energy to countries it seeks to influence.

The central point is that fossil fuels enable coercion because they are essential, concentrated and infrastructure-dependent. The more dependent an importer is, the greater the leverage available to the supplier. The less diversified the infrastructure, the sharper the coercive potential. The weaker the storage, interconnection and demand-reduction capacity, the more effective the threat. Energy coercion is therefore not an exceptional distortion of fossil fuel systems. It is a recurring strategic possibility built into the structure of dependence.

[171] Jonathan Stern, ed., *The Pricing of Internationally Traded Gas* (Oxford: Oxford Institute for Energy Studies, 2012).

[172] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[173] Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

Form of coercion	How it works	Typical target	Example
Supply cut or suspension	Exports or flows are reduced or halted to apply pressure.	Import-dependent states and industries.	Russian gas cuts to Europe.
Threatened disruption	Explicit or implicit warning that supply may be interrupted.	Governments, markets, shipping firms.	Iranian threats around the Strait of Hormuz.
Price manipulation	Supply decisions or pricing strategies raise costs for political effect.	Consumers, governments, political coalitions.	1973–74 oil embargo and producer leverage.
Contractual leverage	Long-term contracts, payment terms or destination clauses create dependence.	Utilities, states, industrial buyers.	Gazprom-linked supply arrangements.
Infrastructure dependency	Ownership or control of pipelines, ports, terminals or storage creates pressure.	Transit or import states.	Nord Stream and other pipeline dependencies.
Shipping-route pressure	Attacks or threats to tankers and transit routes disrupt flows and raise insurance costs.	Global trade and energy markets.	Houthi attacks affecting Red Sea shipping.
Artificial scarcity / market signalling	Market expectations are shaped to trigger panic, stockpiling or price spikes.	Financial markets and importers.	Crisis signalling during supply tensions.

Table 4. Forms of fossil energy coercion

4.2 Supply cuts and threatened disruption

Supply cuts are the most direct form of fossil energy coercion. They occur when a producer, transit state or infrastructure controller deliberately reduces or halts deliveries to impose costs on another actor. The objective may be to force policy change, punish an unfriendly government, extract payment concessions, deter military action, influence public opinion, weaken sanctions or divide alliances.[174]

A supply cut does not need to be total to be effective. Partial reduction can create uncertainty, raise prices and force emergency procurement. The target state may have to draw on reserves, subsidise households, reduce industrial consumption, reopen more carbon-intensive generation or seek alternative imports at higher cost. In democratic societies, these pressures can become politically significant.

Threatened disruption can also be coercive. A state does not need to close a pipeline or block a strait if the credible threat is sufficient to affect market behaviour. Energy markets are sensitive to expectation. If traders, utilities, insurers and governments believe supply may

[174] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026.

be disrupted, prices can rise before any physical shortage occurs. This gives energy threats a psychological and financial dimension.

Supply cuts have several effects:

1. Impose economic costs. Higher energy prices feed into inflation, industrial costs, transport costs and household bills.
2. Create political pressure. Governments may face public anger, business lobbying and pressure to soften foreign policy positions.
3. Test alliance unity. States with different levels of dependence may disagree over sanctions, military assistance, emergency procurement or diplomatic posture.
4. Redirect policy resources. A government forced into emergency energy procurement has less capacity to focus on other strategic priorities.
5. Reward compliant states and punish resistant ones. Selective supply disruption may be used to divide blocs or expose the most vulnerable members of an alliance.

The 1973–74 oil embargo demonstrated the impact of organised supply coercion. Arab oil producers used export restrictions and production cuts in response to Western support for Israel during the October 1973 war. The effect was felt across industrialised economies, leading to fuel shortages, price increases and institutional responses, including the creation of the International Energy Agency.[175]

Russia's conduct towards Europe before and after February 2022 demonstrated the same logic in pipeline-gas form. Reductions in gas flows, disputes over payment in roubles, halted deliveries to specific countries and uncertainty around Nord Stream created economic and political pressure across Europe. The European Union's subsequent reduction of Russian fossil fuel dependence was therefore not simply an energy-market adjustment. It was a strategic response to coercion.[176]

Threatened disruption around the Strait of Hormuz illustrates a maritime version of the same mechanism. Iran does not need to close the strait fully to affect oil markets. Statements, military exercises, tanker seizures, missile threats, mining concerns or regional escalation can raise risk premiums and affect shipping behaviour. The value of the threat lies in the concentration of energy flows through a narrow passage.[177]

Supply coercion works best when the target has limited alternatives. Storage, demand flexibility, diversified suppliers, interconnectors and strategic reserves reduce vulnerability. A state that can switch routes, draw on reserves, reduce consumption or substitute fuels is harder to coerce. This is why resilience measures are central to energy security.

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[175] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; International Energy Agency, 'History of the IEA', IEA, accessed 4 June 2026.

[176] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[177] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

4.3 Price manipulation and artificial scarcity

Energy coercion can operate through price as well as supply. Because oil, gas and coal are essential inputs, price increases can impose costs even when physical deliveries continue. Price manipulation may arise from production cuts, export restrictions, cartel behaviour, strategic signalling, withholding of spot volumes, or deliberate creation of uncertainty.

Oil markets are especially sensitive to price effects because oil is globally traded and central to transport, petrochemicals, agriculture and military mobility. Even a disruption in one region can affect prices worldwide. Gas markets were historically more regional, particularly where pipeline systems dominated, but LNG has made gas increasingly global. Coal prices can also be affected by export restrictions, shipping disruption and sudden demand shifts.[178]

Price manipulation may be difficult to prove because producers can present decisions as commercial, technical or market-based. A state may claim that lower supply reflects maintenance, contractual disputes, sanctions complications or domestic demand. Nevertheless, when supply behaviour aligns with political objectives, coercive intent may be inferred from context, timing and official statements.

Artificial scarcity can be created in several ways. A producer may reduce production or exports despite having capacity. A transit state may delay flows. A company controlled by the state may decline to fill storage. A supplier may withhold spot-market volumes. A group of producers may agree output cuts. An armed group may attack shipping or infrastructure to raise risk premiums. A state may threaten action around a chokepoint. All these measures can raise prices.

Price manipulation has particular political value because it spreads costs broadly. A gas supply cut affects direct customers; a price shock affects entire markets. States not directly targeted may still suffer. This can dilute responsibility and complicate response. A producer can claim that the market, not policy, is responsible.

Russia's reduction of gas flows to Europe showed the power of price pressure. Even where physical shortages were avoided, high prices affected households, industry and public finances. European governments spent heavily on support measures, storage filling and alternative supply. The crisis showed that energy weaponisation can impose costs without total interruption.[179]

OPEC's history also illustrates the political significance of collective production decisions. OPEC is not simply a coercive actor; it is a producer organisation with commercial and fiscal interests. Many production decisions are driven by price stability, revenue needs and market management. However, the 1973 embargo showed that oil-producing states can use production and export policy for political purposes. Later output decisions have usually been

[178] International Energy Agency, *Oil Market Report* (Paris: IEA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024).

[179] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

presented in market-management terms, but they continue to carry geopolitical consequences because oil prices affect every major economy.[180]

Artificial scarcity can also empower fossil fuel exporters indirectly. When global prices rise, producers not involved in the immediate crisis may benefit from windfall revenues. This can complicate sanctions policy. A poorly designed embargo may reduce volumes but increase prices, allowing the targeted exporter to preserve or even increase revenue. This is why price caps and revenue-targeting mechanisms have become important in sanctions policy against Russia.[181]

The policy lesson is that energy security cannot be measured only by volume. A state may have sufficient physical supply but still face serious insecurity if prices become unaffordable or politically destabilising. Affordability is therefore a security variable. Efficiency, demand reduction, electrification and renewable deployment reduce exposure not only to physical supply cuts but also to fossil fuel price shocks.

4.4 Long-term contracts as strategic leverage

Long-term fossil fuel contracts can provide stability, but they can also create leverage. They may lock customers into particular suppliers, pricing formulas, infrastructure arrangements and legal obligations. In normal conditions, this can support investment and predictable supply. In crisis, it may restrict flexibility.

Pipeline gas contracts are especially relevant. Building a pipeline requires large investment and long payback periods. Producers and importers often sign long-term contracts to justify infrastructure costs. These contracts may include take-or-pay clauses, oil-indexed pricing, destination restrictions, arbitration provisions and currency terms. The legal and financial complexity can make rapid exit costly.[182]

Supplier leverage can arise in several ways:

1. The supplier may demand changes to payment terms. Russia's demand for rouble payments in 2022 was an example of contractual terms becoming political leverage.
2. The supplier may exploit ambiguity. Technical issues, sanctions-related claims or disputes over maintenance can be used to justify reduced flows.
3. The supplier may differentiate between customers. States considered politically compliant may receive more favourable treatment than those taking a harder line.
4. Contracts may deter policy action. Governments or companies may hesitate to support sanctions if they fear legal penalties, compensation claims or supply loss.

[180] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026.

[181] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[182] Jonathan Stern, ed., *The Pricing of Internationally Traded Gas* (Oxford: Oxford Institute for Energy Studies, 2012).

5. Long-term commitments may slow transition. A state locked into future gas purchases may delay electrification or renewable deployment.[183]

Contractual leverage is not limited to gas. LNG contracts can include destination clauses and fixed-term commitments. Oil supply agreements may include long-term discounts, refinery configurations or credit arrangements. Coal contracts may tie power plants or industrial consumers to specific suppliers.

The strategic problem is not the existence of long-term contracts as such. Energy systems require investment certainty. The problem arises when contracts create dependence on a supplier whose political interests are hostile or unpredictable. Contract design should therefore be part of security policy.

A secure contract structure should include diversification, flexibility, transparency and exit options. It should avoid excessive exposure to a single supplier. It should include provisions for sanctions compliance and crisis response. It should be compatible with long-term decarbonisation. It should be scrutinised not only by energy ministries and companies, but also by security and foreign-policy institutions where strategic exposure is significant.

Europe's experience with Russian gas demonstrated the risk of treating contracts as purely commercial. Long-term arrangements with Gazprom were embedded in a wider geopolitical relationship. The political risk was visible before 2022, particularly in Central and Eastern Europe, but it was not fully integrated into EU-wide energy strategy. The lesson is that contract security must be assessed alongside price and supply reliability.[184]

4.5 Pipelines, ownership and infrastructure dependency

Energy infrastructure can create dependency even when supply contracts appear diversified. Pipelines, ports, terminals, refineries, storage sites and electricity interconnectors shape the practical options available to states. Infrastructure determines where energy can come from, where it can go, how quickly it can be rerouted and who has the ability to interrupt it.

Pipelines are the clearest example. They are fixed, linear assets. They connect specific producers, transit states and consumers. They are expensive to build and politically difficult to replace. They can bypass some states and empower others. They can create dependency not only on a supplier but also on transit routes.[185]

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[183] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[184] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022).

[185] Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020); European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the*

Pipeline politics has several dimensions. A supplier may promote a route that increases dependence on itself. A transit state may use its position to extract fees or political concessions. A consumer may support a pipeline to obtain cheaper supply but thereby increase strategic exposure. External powers may oppose pipelines that strengthen adversaries. Infrastructure choices therefore become foreign-policy choices.

Nord Stream illustrates this problem. Its supporters presented it as a commercial route to bring Russian gas directly to Germany. Its critics, especially in Central and Eastern Europe, argued that it increased dependence on Russia, bypassed Ukraine and weakened European strategic cohesion. The sabotage of the pipelines in September 2022 then exposed a second dimension: undersea energy infrastructure is physically vulnerable and difficult to protect.[186]

Ownership also matters. Strategic infrastructure owned or controlled by companies linked to hostile or authoritarian states may create security risks. This applies to storage facilities, terminals, ports, electricity grids and energy companies. Ownership can provide access to sensitive information, influence over investment decisions, or the ability to delay or restrict operations.[187]

Storage is particularly important. Gas storage determines whether states can absorb winter disruption. If storage facilities are controlled by a supplier with coercive intent, they may not be filled adequately before crisis. Europe's post-2022 storage rules reflected recognition that storage is not merely a commercial asset but a security instrument.[188]

Refineries and ports also create dependency. A refinery configured for a particular crude grade may not be able to switch easily. A port handling major energy imports may become a strategic target. LNG terminals increase flexibility but also create dependence on shipping, regasification capacity and global cargo availability.

Infrastructure dependency can also affect transition. A state that invests heavily in new fossil fuel infrastructure may create political and financial pressure to keep using it. This can produce lock-in. LNG terminals, pipelines and gas-fired power plants built for emergency security reasons may become long-term assets unless policy carefully limits their role.

The policy implication is that infrastructure planning must include security review. Cost and capacity are not enough. Governments should ask: Does this infrastructure create dependence on a risky supplier? Does it bypass vulnerable allies? Is it resilient to sabotage?

Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[186] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022.

[187] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *Guidance to the Member States concerning Foreign Direct Investment and Free Movement of Capital from Third Countries, and the Protection of Europe's Strategic Assets, ahead of the Application of Regulation (EU) 2019/452*, C(2020) 1981 final, Brussels, 25 March 2020.

[188] Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

Can it be repurposed? Does it delay transition? Who owns and operates it? What happens if the supplier becomes hostile?

Infrastructure is strategy in physical form. Once built, it shapes choices for decades.

4.6 Russia's use of gas against Europe

Russia's use of gas against Europe is the strongest contemporary European case of fossil fuel coercion. It combined supplier dominance, pipeline dependence, state-controlled energy companies, contract disputes, storage concerns, infrastructure politics and wartime pressure. The case is central because it shows how a major energy supplier can convert commercial dependence into strategic leverage.[189]

Before the full-scale invasion of Ukraine in February 2022, Russian gas played a major role in the European energy system. Several EU Member States depended heavily on Russian pipeline gas. Russian gas was integrated into industrial production, heating systems and electricity markets. For years, many policymakers treated this relationship as mutual interdependence. Russia needed European revenue; Europe needed Russian gas. The assumption was that economic interdependence would moderate behaviour.

That assumption failed. Russia demonstrated that it was willing to use energy supply as a political instrument even at economic cost. It reduced flows, demanded rouble payments, halted deliveries to specific states and created uncertainty around major routes. The effect was to increase prices, test European unity and raise the cost of supporting Ukraine.[190]

Russia's energy coercion did not begin in 2022. Central and Eastern European states had warned for years that Russian energy policy was political. Previous gas disputes involving Ukraine had already disrupted European supply. Gazprom's role was not that of an ordinary commercial firm operating independently from state strategy. It was a state-aligned energy company whose decisions were embedded in Russian foreign policy.[191]

The 2022 crisis made this visible across the EU. It forced emergency policy responses, including gas storage rules, demand-reduction measures, LNG procurement, diversification, price intervention debates and acceleration of renewable deployment. It also changed the political framing of energy transition. Reducing fossil dependence became not only a climate objective but a security imperative.[192]

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[189] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[190] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; European Commission, *REPowerEU Plan*, COM (2022) 230 final, Brussels, 18 May 2022.

[191] Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020).

[192] European Commission, *REPowerEU Plan*, COM (2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

4.6.1 Gazprom and contractual leverage

Gazprom has been central to Russia's energy relationship with Europe. As a state-controlled company and dominant gas exporter, it served both commercial and strategic functions. Its long-term contracts, pipeline control and market position gave Russia leverage over European customers.[193]

Gazprom's contractual leverage operated through several channels. Long-term supply agreements created dependency. Pricing formulas affected national energy costs. Disputes over payment terms could become political. Claims about technical issues or maintenance could justify flow reductions. Selective treatment of customers could create division.

The rouble payment demand in 2022 illustrated how contractual terms could be politicised. After sanctions were imposed on Russia, Moscow required certain buyers to pay for gas through mechanisms involving rouble conversion. Some states refused, and supplies were halted. This was not a normal commercial adjustment. It was a political demand linked to sanctions and Russia's attempt to impose costs on European states.[194]

Gazprom's behaviour also showed how uncertainty can be coercive. Even before a full interruption, reduced nominations, maintenance disputes and unclear future flows affected prices and planning. European governments and companies had to prepare for scenarios in which flows would fall further or stop entirely.

The policy lesson is that state-controlled suppliers from adversarial states cannot be assessed only through price and delivery history. Contractual reliability is political. A supplier that is reliable in normal times may become coercive in crisis. Risk assessment must therefore include state intent, ownership structure, geopolitical alignment and the potential for contract manipulation.

4.6.2 Nord Stream and strategic dependency

Nord Stream became one of the most contested energy infrastructure projects in Europe because it symbolised the tension between commercial supply and strategic dependency. The pipelines connected Russia directly to Germany through the Baltic Sea, bypassing traditional transit routes through Ukraine and parts of Central and Eastern Europe.[195]

Supporters argued that Nord Stream improved supply security by providing a direct route and reducing transit risk. Critics argued that it increased dependence on Russia, weakened Ukraine's transit role, divided Europe and gave Moscow more flexibility to pressure some states while maintaining supply to others. The criticism was not only symbolic. Transit

[193] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[194] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[195] Katja Yafimava, 'Gas Directive Amendment: Implications for Nord Stream 2', Oxford Institute for Energy Studies, March 2019.

routes matter. A pipeline that bypasses Ukraine reduces Ukraine's strategic importance and transit revenue. It also allows Russia to separate its energy relationship with Western Europe from its pressure on Eastern Europe. Infrastructure can therefore alter political incentives.[196]

Nord Stream 2 intensified these concerns. Even before it entered operation, it became a major geopolitical dispute involving Germany, the United States, Ukraine, Poland, the Baltic states and EU institutions. The project showed how infrastructure can divide allies. It also showed that different states assess energy risk differently depending on geography, history and dependence.[197]

The sabotage of the Nord Stream pipelines in September 2022 introduced another dimension. Undersea pipelines are physically vulnerable. They are difficult to monitor continuously, difficult to repair quickly and located in contested maritime environments. The incident reinforced NATO and EU concern about critical undersea infrastructure, including pipelines, cables and energy links.[198]

Nord Stream therefore illustrates three lessons. First, infrastructure can create dependency. Secondly, infrastructure can divide allies. Thirdly, infrastructure can become a target. All three are central to the security analysis of fossil fuel systems.

4.6.3 Pressure on Central and Eastern Europe

Central and Eastern European states have been particularly sensitive to Russian energy coercion because of geography, historical experience and infrastructure dependency. Many of these states inherited pipeline networks oriented towards Soviet and Russian supply. Some had limited access to alternative routes, LNG terminals or interconnectors. This created vulnerability.[199]

For Poland, the Baltic states, Bulgaria, Slovakia, Hungary and others, energy dependence on Russia was never only a commercial issue. It was linked to sovereignty, foreign policy and historical experience of Soviet domination. These states often warned that Russia would use energy as leverage. Their concerns were sometimes treated as political or regional rather than strategic. The 2022 crisis vindicated many of those warnings.

Supply cuts to Poland and Bulgaria in 2022 demonstrated the use of selective pressure. States that refused Russia's rouble payment mechanism were punished. Finland also faced halted gas supplies after refusing the payment demand. The volumes involved differed by

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[196] Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020).

[197] Paul Belkin, Michael Ratner, Cory Welt and Beryl E. Taylor, *Nord Stream 2: A Fait Accompli?*, Congressional Research Service, 18 March 2019; Paul Belkin, Cory Welt and Michael Ratner, *Russia's Nord Stream 2 Natural Gas Pipeline to Germany Halted*, Congressional Research Service, 10 March 2022.

[198] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[199] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM (2022) 230 final, Brussels, 18 May 2022.

country, but the political message was clear: gas supply could be used to impose costs on states taking positions opposed by Moscow.[200]

Central and Eastern Europe's response also shows how resilience can be built. LNG terminals in Poland and Lithuania, interconnectors, reverse-flow capacity, storage, diversification and regional co-operation reduced vulnerability. The Baltic states moved rapidly to end Russian gas dependence. Poland had already invested in alternative infrastructure before 2022. These measures did not eliminate all risk, but they reduced coercive leverage.[201]

The lesson for the EU is that energy security must account for the most vulnerable members of the system. A dependency that appears manageable at aggregate EU level may be severe for a particular Member State. Solidarity mechanisms, interconnectors and common procurement are therefore not only market tools. They are political instruments of alliance cohesion.

4.6.4 The 2022 invasion of Ukraine and the European response

Russia's full-scale invasion of Ukraine transformed European energy policy. Before 2022, the EU's climate agenda, gas-market policy and energy-security concerns often moved on parallel tracks. After the invasion, they converged. Reducing Russian fossil fuel dependence became both a security and transition objective.[202]

The EU response had several components:

1. It pursued diversification. Europe increased LNG imports, secured alternative pipeline supplies and sought new agreements with non-Russian suppliers. This reduced immediate exposure but also raised questions about new dependencies.
2. It reduced demand. Gas consumption fell through efficiency, behavioural change, industrial adjustment and policy measures. Demand reduction proved one of the most important tools for reducing vulnerability.[203]
3. It filled storage. EU rules required storage facilities to reach high levels before winter. Storage became a strategic asset rather than a purely commercial buffer.[204]
4. It accelerated renewables and electrification. The crisis strengthened the argument that domestic low-carbon energy reduces exposure to imported fossil fuels.

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[200] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[201] European Commission, REPowerEU Plan, COM (2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024); International Energy Agency, Gas Market Report, Q4 2022 (Paris: IEA, 2022).

[202] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Council, *Versailles Declaration*, Versailles, 10–11 March 2022.

[203] International Energy Agency, *Energy Efficiency 2023* (Paris: IEA, 2023); European Commission, *REPowerEU: One Year Later* (Brussels: European Commission, 2023).

[204] Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

5. It adopted sanctions. Russian coal imports were banned, Russian seaborne oil was restricted, and oil price-cap measures were developed with G7 partners. The objective was to reduce Russia's revenue while limiting market disruption.[205]
6. It strengthened infrastructure planning. Interconnectors, LNG terminals, grids and critical infrastructure protection became more urgent.

The response showed that dependence can be reduced faster than many assumed, but at significant cost. Europe paid higher prices, subsidised households and industry, and reorganised supply under pressure. The adjustment was possible because of political will, market capacity, mild weather in some periods, demand reduction and global supply access. It should not be assumed that every future crisis would be equally manageable.

The strategic lesson is that energy transition and energy security are linked. The more Europe reduces fossil demand, the less vulnerable it becomes to fossil coercion. Diversification is necessary during transition, but structural resilience comes from lowering dependence itself.

4.7 OPEC and the historical precedent of the oil embargo

The 1973–74 oil embargo remains the most important historical precedent for fossil fuel coercion. Arab oil producers used export restrictions and production cuts to pressure states supporting Israel during the October 1973 war. The embargo caused fuel shortages, price increases and economic disruption in importing countries. It also transformed the institutional landscape of energy security.[206]

The embargo demonstrated four enduring realities:

1. Energy exporters can co-ordinate supply restrictions for political purposes. The embargo was not simply a market adjustment; it was linked to diplomatic objectives.
2. Import dependence can limit political autonomy. Industrialised states discovered that their foreign policy positions could carry direct energy costs.
3. Fossil fuel price shocks can have economy-wide effects. Oil prices affected inflation, growth, transport, industry and public confidence.
4. Crisis produces institutions. The creation of the International Energy Agency and strategic stockholding arrangements reflected recognition that energy security required collective preparation.[207]

OPEC itself should not be understood only through the lens of coercion. It is an organisation of oil producers seeking to manage market conditions and protect members' interests. Many production decisions are driven by fiscal, commercial and market considerations rather than explicit political coercion. However, the 1973 embargo established that oil-export policy can

[205] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022.

[206] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991).

[207] International Energy Agency, 'History of the IEA', IEA, accessed 4 June 2026; International Energy Agency, 'Oil Security and Emergency Response', IEA, accessed 4 June 2026.

be weaponised. It also showed that producer states can exert influence disproportionate to their military power when importers are dependent.[208]

The oil embargo differs from Russia's gas coercion in important ways. Oil was globally traded, while Russian gas dependence involved fixed pipelines. The embargo was a collective producer action, while Russia's gas pressure was state-specific. Oil affected all importers through a global market, while gas pressure was more geographically concentrated. Nevertheless, both cases show that fossil fuel dependence can become a tool of political leverage.

For contemporary Europe, the relevance of the embargo lies in institutional memory. Strategic reserves, demand management, diversification and international co-ordination remain necessary. However, the deeper lesson is that the safest way to reduce coercive leverage is to reduce dependence on the coercible commodity. Emergency stocks can manage shocks, but they do not remove vulnerability if the economy remains structurally dependent.

4.8 Iran, Hormuz and the threat of maritime disruption

The Strait of Hormuz is one of the most important energy chokepoints in the world. It connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. Major oil and LNG exporters depend on it to reach global markets. Any serious disruption would affect not only regional states but also global prices, shipping, insurance and strategic planning.[209]

Iran's position near Hormuz gives it a form of geographic leverage. Even without closing the strait, Iran can influence risk perceptions through military exercises, missile deployments, tanker seizures, naval harassment, mining threats or statements by officials. Because so much energy passes through the route, markets respond to the possibility of disruption.

A full closure of Hormuz would be difficult to sustain and would also harm Iran and other regional actors. It would likely provoke a strong international response. However, coercion does not require full closure. Temporary disruption, selective harassment or heightened risk can still raise insurance costs, delay shipping and increase prices.

Hormuz illustrates the difference between physical control and strategic influence. Iran does not need to control all traffic through the strait to affect global markets. It only needs to create credible risk. This is why chokepoints are so important in fossil fuel security. They concentrate flows in narrow spaces where threats have amplified effects.

The Hormuz risk also affects Europe indirectly. Even if Europe imports less oil directly from the Gulf than Asian economies do, global oil prices are integrated. A Gulf disruption can raise prices worldwide. LNG markets are also affected because Qatar, a major LNG exporter, relies

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[208] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon & Schuster, 1991); Fiona Venn, *Oil Diplomacy in the Twentieth Century* (Basingstoke: Macmillan, 1986).

[209] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

on Hormuz. European efforts to diversify away from Russian pipeline gas through LNG can therefore increase exposure to maritime chokepoints.[210]

This does not mean that LNG diversification was wrong. It was necessary in the short term after Russia's invasion of Ukraine. But it shows that diversification within fossil fuels does not eliminate vulnerability. It changes its geography. Pipeline dependence on Russia may be reduced, while exposure to LNG shipping routes, global prices and Gulf security becomes more relevant.

Hormuz also demonstrates why maritime security is energy security. Naval presence, demining capacity, surveillance, convoy planning, crisis diplomacy and regional deterrence all affect energy markets. NATO as an alliance is not the sole actor in the Gulf, but NATO members have direct interests in global energy stability. The EU also has an interest in ensuring that energy transition reduces exposure to such chokepoints over time.[211]

The policy implication is clear: Europe should reduce oil and gas demand while maintaining maritime-security awareness during the transition. A lower-fossil energy system would not remove the strategic importance of the Gulf overnight, but it would reduce the extent to which European economies can be pressured by events in one narrow strait.

4.9 Houthi attacks, the Red Sea and pressure on shipping routes

The Houthi attacks on shipping in and around the Red Sea have demonstrated how non-state actors can exert pressure on global trade and energy routes. The Bab el-Mandeb Strait connects the Red Sea to the Gulf of Aden and the wider Indian Ocean. It is essential for traffic moving between Europe and Asia through the Suez Canal. Disruption in this area affects container shipping, oil products, LNG movements, insurance, freight rates and supply-chain timing.[212]

The attacks show that energy-route coercion is not limited to major states. Armed groups with missiles, drones, small boats, intelligence support or external backing can threaten shipping over significant distances. The cost of disruption can be disproportionate to the cost of attack. A relatively low-cost drone or missile threat can force commercial vessels to reroute around the Cape of Good Hope, adding time, fuel costs and insurance costs.[213]

The Red Sea crisis illustrates several features of modern coercion:

1. Non-state actors can influence global economic systems. They do not need to defeat navies or close a strait completely. They need only make the route risky enough for insurers and shipping companies to alter behaviour.

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[210] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[211] NATO, 'Maritime Security', NATO, accessed 4 June 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: Routledge for the International Institute for Strategic Studies, 2026).

[212] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[213] International Maritime Organization, 'Maritime Security and Safety in the Red Sea and Gulf of Aden', IMO, accessed 4 June 2026; Council of the European Union, 'Security and Freedom of Navigation in the Red Sea: Council Launches EUNAVFOR ASPIDES', 19 February 2024; European External Action Service, 'EUNAVFOR ASPIDES', accessed 4 June 2026.

2. Attacks on commercial shipping can produce indirect energy effects. Even where crude oil flows are not halted, refined products, LNG cargoes, shipping capacity and freight markets may be affected.
3. Route disruption has cumulative costs. Longer voyages require more fuel, more ships, more crew time and more insurance. Delays affect supply chains.
4. Military responses may be necessary but not sufficient. Naval escorts, air defence and strikes against launch sites may reduce risk, but the political conflict driving attacks may persist.
5. Energy transition does not eliminate maritime risk, but reduced oil and gas dependence can reduce the energy-market consequences of such disruption.

The Red Sea case is important because it expands the definition of fossil fuel coercion. The actor applying pressure is not necessarily a producer state. It may be an armed group targeting the routes through which fossil fuels and other goods move. The vulnerability arises from the concentration of trade flows.[214]

For Europe, the Red Sea reinforces the need to view energy security together with trade security and maritime security. The Suez-Bab el-Mandeb route is not only an energy corridor. It is a broader artery of global commerce. However, fossil fuel dependence increases the sensitivity of economies to disruption in such routes.[215]

The case also raises the issue of proxy dynamics. If an armed group receives support from a state actor, attacks on shipping may become part of a wider coercive strategy. Energy-route disruption can therefore connect local conflict, regional rivalry and global economic pressure.

Policy responses must include maritime protection, intelligence sharing, sanctions on weapons supply networks, port security, insurance co-ordination and diplomatic engagement. But the long-term resilience measure remains lower dependence on seaborne fossil fuels.

4.10 Pipeline politics in the South Caucasus and Central Asia

The South Caucasus and Central Asia illustrate how pipelines can shape political alignment, regional competition and strategic dependence. Oil and gas reserves in the Caspian region are valuable not only because of production volumes, but because of their location between Russia, Iran, Turkey, China and Europe. Export routes determine who has influence.[216]

Pipeline politics in the region revolves around several questions. Should oil and gas move north through Russia, west through the South Caucasus and Turkey, south through Iran, or

[214] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[215] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats*, JOIN(2023) 8 final, Brussels, 10 March 2023.

[216] U.S. Energy Information Administration, *Caspian Sea Region* (Washington, DC: EIA, 2013); International Energy Agency, 'Azerbaijan Energy Profile', IEA, accessed 4 June 2026.

east towards China? Each route has political implications. A pipeline is not only a commercial asset; it ties producers to transit states and markets.

For Europe, Caspian energy has often been framed as diversification away from Russia. Pipelines such as Baku-Tbilisi-Ceyhan and the Southern Gas Corridor were strategically significant because they provided routes that bypassed Russia. Azerbaijan became an important supplier for parts of Europe, particularly after the reduction of Russian gas imports.[217]

However, diversification is not the same as full resilience. Dependence on new suppliers and transit routes creates new political considerations. The South Caucasus has unresolved conflicts, border tensions, Russian influence, Turkish interests and Iranian concerns. Infrastructure can be vulnerable to military escalation, sabotage or political pressure. A pipeline route that reduces dependence on one actor may increase exposure to another set of risks.[218]

Central Asia presents similar issues. Kazakhstan's oil exports, for example, have historically depended heavily on routes crossing Russian territory, including the Caspian Pipeline Consortium route to the Black Sea. This creates vulnerability to Russian regulatory, technical or political pressure. Alternative routes across the Caspian and through the South Caucasus are strategically attractive but require infrastructure, diplomacy and investment.[219]

Turkmen gas illustrates another form of dependency. Export routes to China have given Beijing significant influence. Potential westward routes have long faced technical, legal, commercial and geopolitical obstacles. The result is that Central Asian producers may have reserves but limited strategic autonomy if export routes are constrained.[220]

Pipeline politics also affects transit states. Georgia and Turkey gain strategic importance from energy transit. Ukraine's pre-2022 gas transit role gave it economic and geopolitical significance. Bypassing transit states can weaken them. Supporting transit routes can strengthen them. Infrastructure decisions therefore affect regional power balances.

The policy lesson is that diversification must be assessed politically. It is not enough to identify a non-Russian supply source. Policymakers must assess route security, governance, conflict exposure, supplier behaviour, contract terms and long-term compatibility with decarbonisation. Europe should avoid building new dependencies that reproduce the strategic logic of the old ones.

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[217] European Commission, 'Southern Gas Corridor', European Commission, accessed 4 June 2026; U.S. Energy Information Administration, *Country Analysis Brief: Azerbaijan* (Washington, DC: EIA, 2024).

[218] European Commission, 'Southern Gas Corridor', European Commission, accessed 4 June 2026; International Energy Agency, 'Azerbaijan Energy Profile', IEA, accessed 4 June 2026; U.S. Energy Information Administration, *Country Analysis Brief: Azerbaijan* (Washington, DC: EIA, 2024).

[219] U.S. Energy Information Administration, *Caspian Sea Region* (Washington, DC: EIA, 2013); U.S. Energy Information Administration, *Country Analysis Brief: Kazakhstan* (Washington, DC: EIA, 2024).

[220] International Energy Agency, 'Turkmenistan Energy Profile', IEA, accessed 4 June 2026; International Energy Agency, 'Uzbekistan Energy Profile', IEA, accessed 4 June 2026; Shamil Yenikeyeff, *Kazakhstan's Gas: Export Markets and Export Routes* (Oxford: Oxford Institute for Energy Studies, 2008).

In the South Caucasus and Central Asia, energy policy should be integrated with conflict prevention, infrastructure protection, transparency and transition planning. Exporting states need diversification beyond hydrocarbons; importing states need energy diversification beyond fossil fuels.

4.11 Lessons for Europe and NATO

The cases examined in this chapter point to several lessons for Europe and NATO.

The first lesson is that fossil fuel coercion is not theoretical. It has occurred through oil embargoes, gas supply cuts, tanker threats, pipeline politics and attacks on shipping. Energy weaponisation is an established practice.

The second lesson is that dependence determines vulnerability. A threat has limited effect if the target has alternatives. It becomes powerful when supply is concentrated, infrastructure is fixed and demand is inflexible.

The third lesson is that coercion may operate through uncertainty as much as physical interruption. Price spikes, market panic, insurance costs and public anxiety can achieve political effects before a full supply cut occurs.

The fourth lesson is that infrastructure is central. Pipelines, terminals, storage, refineries, ports and cables shape strategic options. Their ownership, location and protection should be treated as security issues.[221]

The fifth lesson is that diversification within fossil fuels is necessary but insufficient. Replacing Russian pipeline gas with LNG reduces one dependency but may increase exposure to global gas markets, shipping routes and other suppliers. Real resilience requires lower fossil demand.

The sixth lesson is that alliance cohesion depends on energy resilience. States with different exposure levels may have different risk perceptions. EU and NATO solidarity requires infrastructure links, common planning, emergency sharing and recognition of vulnerable members' concerns.[222]

The seventh lesson is that coercion can come from states, producer organisations, transit actors or armed groups. The policy response must therefore combine energy policy, sanctions, maritime security, intelligence, infrastructure protection and conflict diplomacy.

The eighth lesson is that energy transition must be designed as a security project. Renewables, electrification, storage, grids and efficiency reduce the scope for fossil fuel

[221] NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

[222] Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010, *Official Journal of the European Union*, L 280, 28 October 2017, pp. 1–56; Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

coercion. However, they must be accompanied by critical minerals strategy, cyber security and industrial capacity to avoid new vulnerabilities.[223]

For NATO, the relevance lies in resilience, deterrence and protection of critical infrastructure. Energy systems support military mobility, industrial production, communications and civilian continuity. Attacks on energy infrastructure can weaken societies without direct battlefield confrontation. Hybrid threats against pipelines, cables, ports and grids should therefore be treated as part of alliance security.[224]

For the EU, the relevance lies in integrating energy transition with foreign policy, sanctions, industrial strategy and enlargement. Energy policy cannot be left solely to markets when suppliers may act strategically. The EU should assess energy dependencies through the same lens it applies to other strategic vulnerabilities.[225]

The central conclusion of this chapter is that fossil fuels can be converted into instruments of coercion because they are essential, concentrated and infrastructure-dependent. The most effective long-term response is not only to secure alternative fossil supply, but to reduce the strategic importance of fossil fuels in the energy system itself.

Chapter 5

Fossil Fuels and the Financing of War

5.1 Fossil fuel revenue as an enabling factor in conflict

Fossil fuels can finance war even when they do not cause it. This distinction is central to a credible security analysis. Oil, gas and coal are not the sole explanation for most armed conflicts. Wars are usually driven by a combination of political power, territory, ideology, identity, security dilemmas, regime survival, institutional weakness and external intervention. However, fossil fuel revenues can provide the money, foreign exchange and logistical capacity that allow states and armed groups to sustain violence.[226]

In this sense, fossil fuels are often best understood as enabling factors. They may not explain why a conflict begins, but they can affect its duration, intensity and international reach. A state with substantial oil or gas income may be better able to fund armed forces, procure weapons, pay security services, subsidise allies, support proxy groups, absorb sanctions and maintain domestic patronage. A non-state armed group that captures oilfields, refineries,

[223] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[224] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026.

[225] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

[226] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

fuel depots or smuggling routes may acquire a revenue stream that gives it operational independence.[227]

Fossil fuel revenue has several characteristics that make it strategically significant/

1. It can be large. Oil and gas exports often generate revenue on a scale far beyond other sectors in producer economies. Where the state controls export income, it can use those funds to support military and security priorities.[228]
2. It is internationally convertible. Oil and gas are sold in global markets, often in hard currency. This gives producers access to foreign exchange that can be used for imports, weapons procurement, technology acquisition or sanctions evasion.[229]
3. It can be centralised. A small number of state institutions, national oil companies, ministries, military-linked firms or ruling elites may control the flow of revenue. This allows governments to direct funds with limited public oversight.[230]
4. It is difficult to replace quickly. A producer state dependent on hydrocarbon exports may have few alternative sources of fiscal revenue. This gives both the producer and those seeking to restrict it strong incentives to fight over continued access to export income.
5. It can be obscured. Oil cargoes may be blended, reflagged, transferred ship-to-ship, sold through intermediaries, discounted, insured through opaque channels or refined in third countries. This makes fossil fuel revenue resilient under sanctions unless enforcement is sustained and co-ordinated.[231]

For armed groups, fossil fuel revenue works differently but can be equally important. A group does not need to control a fully functioning national oil industry. It may profit from theft, extortion, taxation of transport routes, illegal refining, protection rackets, crude sales at discount, fuel smuggling or control of local distribution. In weak states and conflict zones, fuel often becomes a parallel currency because civilians, fighters, transporters and generators all need it.[232]

The security implication is that fossil fuels can prolong conflict by lowering the financial constraints on belligerents. A war that might otherwise become unaffordable can continue if one party retains access to oil revenue. A sanctioned state can maintain military expenditure if it preserves export routes. A militia can resist disarmament if it controls a terminal,

[227] Paul Collier and Anke Hoeffler, 'Greed and Grievance in Civil War', *Oxford Economic Papers*, vol. 56, no. 4, 2004, pp. 563–595; Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

[228] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Terry Lynn Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (Berkeley, CA: University of California Press, 1997).

[229] Ibid.

[230] Hazem Beblawi and Giacomo Luciani, eds., *The Rentier State* (London: Croom Helm, 1987); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

[231] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[232] Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015).

refinery or smuggling corridor. Fossil fuel finance can therefore undermine ceasefires, peace agreements and state consolidation.[233]

This chapter examines these dynamics through state and non-state cases. Russia demonstrates the role of fossil fuel exports in sustaining state capacity during a major interstate war. ISIS demonstrates the use of captured oil assets by a non-state armed group. Libya illustrates competition over oil terminals in a fragmented state. Sudan and South Sudan show the destabilising effect of fiscal dependence and transit vulnerability. Iran illustrates the relationship between oil revenue, sanctions, regional networks and state resilience. The chapter concludes by considering implications for sanctions and conflict-prevention policy.

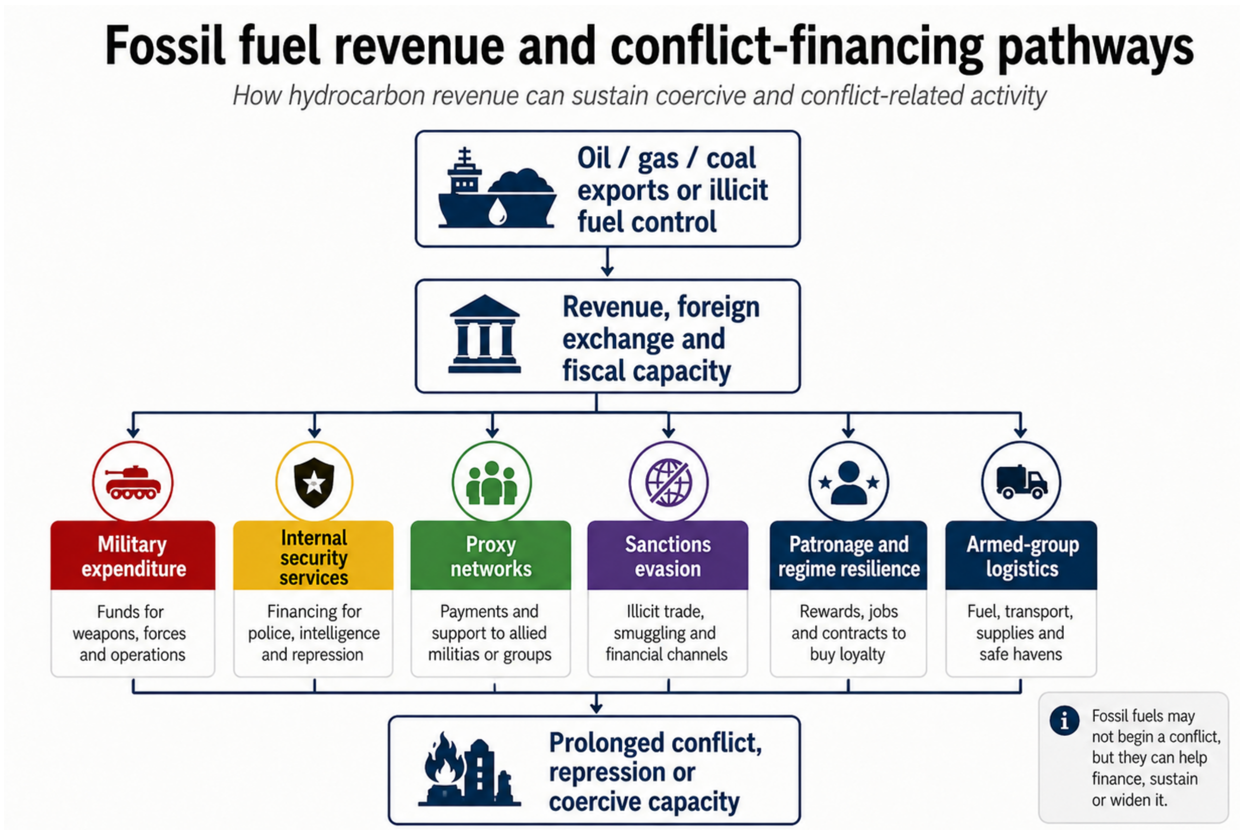

Figure 5. Fossil fuel revenue and conflict-financing pathways. Fossil fuel income can sustain military operations, armed groups, internal repression, sanctions evasion and patronage networks even where fossil fuels were not the original cause of conflict.

[233] Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005); World Bank, Natural Resources and Violent Conflict: Options and Actions (Washington, DC: World Bank, 2003).

5.2 Direct causation versus conflict financing

A clear distinction must be made between fossil fuels as a direct cause of conflict and fossil fuels as a source of conflict financing. The distinction is not merely academic. It determines how policy should respond.

A direct-cause argument claims that conflict occurs primarily because actors seek to control fossil fuel reserves, revenues, infrastructure or territory. Such cases exist, but they are less common than public debate often assumes. Even where oil or gas matters, it usually interacts with broader political, territorial and security factors.[234]

A conflict-financing argument is different. It does not require fossil fuels to have caused the war. It argues that fossil revenues help sustain, expand or internationalise the conflict once it exists. This is often the stronger claim. Evidence may show that a state or armed group used oil income to finance weapons, salaries, patronage, imports or security structures without proving that oil caused the conflict in the first place.[235]

The invasion of Kuwait by Iraq in 1990 is a case where oil was close to the centre of the conflict context. Oil production disputes, debt, revenue expectations and control of reserves formed part of the strategic background. Even here, however, the invasion cannot be reduced to oil alone. Regime ambition, regional power, perceived weakness of external deterrence and territorial claims also mattered.[236]

Russia's full-scale war against Ukraine is different. The war was not caused by fossil fuels. It arose from Russia's rejection of Ukrainian sovereignty, imperial claims, security narratives, domestic authoritarianism and geopolitical ambition. However, fossil fuel exports have helped sustain the Russian state's fiscal capacity during the war. Oil and gas revenues form part of the financial environment that allows Russia to continue military expenditure, manage domestic stability and adapt to sanctions.[237]

ISIS provides another distinction. The group did not emerge because of oil. It arose from political breakdown, sectarian conflict, jihadist networks, state collapse and the aftermath of war in Iraq and Syria. Yet once it captured territory containing oil assets, it used oil production, refining, taxation and smuggling as an important source of income. Oil became an enabling factor for armed governance and military operations.[238]

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[234] Emily Meierding, *The Oil Wars Myth: Petroleum and the Causes of International Conflict* (Ithaca, NY: Cornell University Press, 2020); Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013).

[235] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

[236] Lawrence Freedman and Efraim Karsh, *The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order* (Princeton, NJ: Princeton University Press, 1993); Emily Meierding, *The Oil Wars Myth: Petroleum and the Causes of International Conflict* (Ithaca, NY: Cornell University Press, 2020).

[237] Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026); Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026.

[238] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015); Patrick B. Johnston, Jacob N. Shapiro, Howard J. Shatz, Benjamin Bahney, Danielle F. Jung, Patrick K. Ryan

Libya again differs. The collapse of central authority after 2011 was not caused solely by oil. However, oil terminals and export institutions became central to competition among armed factions. Control over oil infrastructure allowed actors to exert leverage over the state and each other.[239]

The distinction between direct cause and financing has several policy consequences/

1. Conflict prevention cannot rely only on removing fossil fuels from the equation. Many conflicts will continue to have political, territorial and ideological causes. Energy transition alone will not prevent all wars.
2. Sanctions and revenue restrictions can still matter even where fossil fuels did not cause the conflict. If oil revenue sustains military operations, reducing that revenue can affect the belligerent's capacity.
3. Post-conflict settlements must address resource governance. Even where fossil fuels did not start the war, control of revenue can obstruct peace if not managed transparently.
4. Attribution should remain cautious. Overclaiming fossil causation can weaken the credibility of policy advocacy. A more precise approach is to classify whether fossil fuels are a cause, enabling factor, coercive instrument, conflict multiplier or environmental consequence.[240]

The analytical framework of this White Paper therefore treats fossil fuel finance as one pathway among several. It is not always the origin of conflict, but it can be decisive in determining how long conflict lasts, how much damage it causes, and whether actors can resist external pressure.

5.3 Russia's oil and gas revenues during the war against Ukraine

Russia's war against Ukraine is the most important current case for European security. Fossil fuel revenue has not caused the war, but it has contributed to the Russian state's ability to sustain it. Oil and gas exports have provided budgetary revenue, foreign currency and macroeconomic resilience. This has allowed Moscow to finance military spending, maintain domestic subsidies, support defence production and absorb some effects of sanctions.[241]

Before the full-scale invasion, Russia was deeply integrated into European energy markets. It supplied significant volumes of gas, oil, petroleum products and coal to EU Member States. This relationship gave Russia revenue and influence. It also gave Europe access to

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and Jonathan Wallace, *Foundations of the Islamic State: Management, Money, and Terror in Iraq, 2005–2010* (Santa Monica, CA: RAND Corporation, 2016).

[239] United Nations Security Council, *Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011)*, UN Doc. S/2024/914, 13 December 2024; Wolfram Lacher, *Libya's Fragmentation: Structure and Process in Violent Conflict* (London: I.B. Tauris, 2020).

[240] Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005); Emily Meierding, The Oil Wars Myth: Petroleum and the Causes of International Conflict (Ithaca, NY: Cornell University Press, 2020).

[241] Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026); Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026.

comparatively cheap fossil energy. The arrangement was often described as mutually beneficial, but it carried strategic risk. The invasion of Ukraine exposed that risk.[242]

After February 2022, Western policy aimed to reduce Russian fossil fuel revenues while limiting disruption to global energy markets. This was difficult because Russia was a major exporter. A complete and sudden removal of Russian oil from global markets could have raised prices sharply, potentially benefiting Russia through higher prices on reduced volumes and harming importers. The resulting sanctions strategy therefore combined embargoes, price caps, restrictions on shipping and insurance, coal bans, oil-product measures and efforts to reduce gas dependence.[243]

Russia adapted. It redirected oil exports towards non-European buyers, used discounted pricing, relied increasingly on opaque tanker arrangements, and benefited from intermediaries and refining in third countries. The fossil fuel trade therefore became a contest between sanctions policy and circumvention.[244]

The Russian case demonstrates several features of fossil fuel war finance:

1. Oil is more difficult to restrict than pipeline gas. Gas infrastructure is geographically fixed. Once Europe reduced Russian pipeline gas flows, Moscow had limited immediate alternatives because pipeline routes to other markets were not equivalent. Oil, by contrast, can be shipped by tanker, rerouted, blended and sold at discount.
2. Revenue depends on both price and volume. Sanctions may reduce volumes but raise global prices, or reduce prices but leave volumes high. Effective policy must target revenue, not only trade flows.
3. Fossil fuel revenues support state capacity indirectly as well as directly. It is not necessary to prove that a particular oil payment bought a particular weapon. Hydrocarbon exports contribute to the fiscal pool from which the state funds war, repression, subsidies and administration.[245]
4. Energy revenue affects political resilience. A state at war needs to finance not only the battlefield but also domestic stability. Pensions, wages, subsidies, regional transfers and security services all matter. Fossil revenues help sustain this wider system.
5. Importers can unintentionally finance aggression. If states continue buying fossil fuels from an aggressor, or buy refined products derived from its crude through third countries, they may indirectly sustain the revenue base of the war effort.

Europe's response since 2022 has therefore combined moral, strategic and economic dimensions. Reducing Russian fossil fuel imports was not only a statement of solidarity with

[242] International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[243] Ibid.

[244] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; Elisabeth Braw, *The Threats Posed by the Global Shadow Fleet — and How to Stop It* (Washington, DC: Atlantic Council, 2024).

[245] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013).

Ukraine. It was also a security necessity. A supplier using force against a European neighbour and coercion against European consumers could no longer be treated as a normal energy partner.[246]

The case also shows why energy transition matters. So long as Europe depends heavily on imported oil and gas, sanctions policy will remain constrained by price and supply concerns. Lower fossil fuel demand gives policymakers more room to restrict revenues to aggressor states. Electrification, efficiency, public transport, heat pumps, renewables and storage are therefore not only climate measures. They expand strategic freedom.[247]

Case	Revenue source	Main mechanism	Security effect	Dominant classification
Russia / war against Ukraine	Oil and gas exports	State fiscal revenue and foreign-exchange earnings	Sustains military spending and sanctions resilience	Enabling factor
ISIS in Iraq and Syria	Captured oilfields, illicit refining and smuggling	Black-market oil sales	Funds armed-group operations and logistics	Enabling factor
Libya	Oil terminals and export shutdown leverage	Control over production and ports	Strengthens armed factions and weakens central authority	Enabling factor
South Sudan	Oil exports and pipeline-linked transit dependence	Extreme fiscal reliance on oil	Budget instability, conflict vulnerability and route pressure	Enabling factor / conflict multiplier
Iran	Oil exports under sanctions and related networks	Revenue for state capacity and regional proxy support	Expands strategic influence despite sanctions pressure	Enabling factor

Table 5. Selected examples of fossil fuel revenue and conflict finance

5.4 Sanctions, price caps and revenue circumvention

Sanctions targeting fossil fuel revenues are complex because energy markets are global, politically sensitive and economically essential. The objective is usually to reduce the target state's revenue without causing supply shocks that harm importers or increase global prices. This is particularly difficult in oil markets.[248]

[246] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025.

[247] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; International Energy Agency, *Energy Efficiency 2023* (Paris: IEA, 2023).

[248] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022.

The sanctions response to Russia illustrates this challenge. The EU and partners restricted Russian coal, seaborne crude oil and petroleum products. The G7 and EU also introduced a price-cap mechanism intended to allow Russian oil to continue flowing to global markets while limiting the price Russia could receive when using Western shipping, insurance and financial services.[249]

The logic of the price cap is strategic. A total embargo by all major buyers was not feasible because non-Western states continued to import Russian oil. If Western services could be used only when oil was sold below a set price, Russia's revenue would be constrained while market supply would continue. The aim was to reduce Russia's fiscal capacity without triggering a global oil-price crisis.[250]

Such mechanisms depend heavily on enforcement. If Russia can use vessels outside Western service networks, obscure cargo origins, rely on non-compliant insurers, transfer oil at sea, manipulate documentation or sell through intermediaries, the price cap loses effectiveness. The emergence of a shadow fleet is therefore a major challenge. These vessels may be older, less transparent, less well insured and more difficult to monitor. They create environmental and maritime safety risks as well as sanctions risks.[251]

Circumvention can occur through several channels.

One is rerouting. Oil previously sold to Europe may be sold to Asia or other markets.

Another is refining loopholes. Russian crude may be refined in a third country and exported as petroleum products to markets that no longer buy Russian crude directly.

A third is ship-to-ship transfer. Cargoes can be moved between vessels to obscure origin.

A fourth is flagging and ownership opacity. Vessels may change flags, ownership structures or management companies.

A fifth is false documentation. Cargo value, origin or destination may be misreported.

A sixth is shadow insurance. Non-Western or opaque insurers may provide cover outside established enforcement channels.

A seventh is blending. Crude from different origins may be mixed, complicating traceability.[252]

The policy problem is that every restriction creates adaptation. Sanctions must therefore be dynamic. They require customs enforcement, maritime surveillance, financial intelligence,

[249] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[250] United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[251] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026.

[252] Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026.

insurer compliance, port-state control, satellite tracking, data-sharing and diplomatic engagement with third countries.[253]

Revenue circumvention also raises the question of political will. Some states may benefit from discounted Russian oil and resist stronger enforcement. Others may formally support sanctions but tolerate loopholes. Companies may seek commercial advantage through ambiguous arrangements. The effectiveness of sanctions therefore depends on sustained political co-ordination.

Sanctions also have humanitarian and market risks. Energy restrictions can raise prices, affecting poorer importers. They can encourage black markets. They can shift trade towards less transparent actors. They can create environmental risk if poorly maintained vessels carry sanctioned oil. These risks do not invalidate sanctions, but they require careful design.[254]

The broader lesson is that fossil fuel revenue is difficult to restrict once an aggressor is embedded in global energy markets. The most durable solution is to reduce structural demand. A world less dependent on oil and gas would give sanctioning states greater freedom to cut off aggressor revenue without destabilising their own economies.

5.5 ISIS oil smuggling in Iraq and Syria

ISIS provides one of the clearest examples of fossil fuels as non-state conflict finance. The group did not arise because of oil, but its control of oil-producing territory in Iraq and Syria gave it access to a valuable revenue stream. Oil helped support its military operations, governance apparatus and internal economy.[255]

At its peak, ISIS controlled or influenced several oilfields, small refineries, transport routes and local fuel markets. It sold crude oil and refined products at discounted prices through networks of middlemen, smugglers and local traders. Some oil was consumed within ISIS-held territory; some moved across front lines or borders through illicit channels. The group taxed production, transport and sales. It also controlled fuel distribution in areas under its rule.[256]

The Financial Action Task Force documented ISIS use of oil as a source of finance, including sales near the wellhead at heavily discounted prices and reliance on smugglers. Estimates of production and revenue varied over time because infrastructure was damaged, territory

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[253] European Commission, ‘Sanctions Adopted Following Russia’s Military Aggression against Ukraine’, European Commission, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[254] International Energy Agency, *Oil Market Report*, Paris: IEA, report series; World Bank, *Commodity Markets Outlook*, Washington, DC: World Bank, April 2026.

[255] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015).

[256] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015); Erika Solomon, Robin Kwong and Steven Bernard, ‘Inside Isis Inc: The Journey of a Barrel of Oil’, *Financial Times*, 14 October 2015.

changed hands and coalition strikes targeted oil assets. Nevertheless, oil was widely recognised as one of the group's important income sources.[257]

ISIS oil finance demonstrates several points:

1. Non-state actors do not need internationally recognised export channels to monetise oil. Local and regional markets can be sufficient where demand is high and governance is weak.
2. Discounted oil can still be profitable. A group that captures production facilities may sell below market price because its extraction costs are low and the asset was seized.
3. Oil infrastructure can support governance. Fuel is essential for transport, electricity generation, agriculture, water pumping and heating. Control of fuel allows an armed group to administer territory and tax daily life.
4. Oil revenue can make armed groups more autonomous. A group with its own income source is less dependent on external donors and may be harder to influence.
5. Targeting oil finance requires more than battlefield operations. It requires control of territory, disruption of smuggling routes, sanctions on traders, border enforcement, local governance restoration and alternative livelihoods.[258]

The response to ISIS oil finance included airstrikes against oil infrastructure, targeting of tanker trucks, sanctions, financial intelligence and efforts to retake territory. These measures reduced revenue but also carried risks. Destroying oil infrastructure can create environmental damage, reduce post-conflict recovery capacity and harm civilians dependent on local fuel. The challenge is to disrupt armed-group finance while limiting long-term harm.[259]

The ISIS case is especially important because it shows that fossil fuel war finance is not only a state problem. Oil can finance insurgency, terrorism, militia governance and criminal networks. Weak state control over resource areas creates opportunities for armed actors. This is relevant beyond Iraq and Syria, including in Libya, Nigeria, parts of Sudan and other fragile settings where fuel theft, smuggling or illicit refining interact with conflict.

For policy, the lesson is that fossil fuel security requires control of local value chains, not only export terminals. Small-scale production, trucking routes, informal refineries and fuel markets may matter. Counter-terrorist finance policy should treat oil and fuel networks as part of the financial system of armed groups.

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[257] Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015).

[258] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015); Patrick B. Johnston, Jacob N. Shapiro, Howard J. Shatz, Benjamin Bahney, Danielle F. Jung, Patrick K. Ryan and Jonathan Wallace, *Foundations of the Islamic State: Management, Money, and Terror in Iraq, 2005–2010* (Santa Monica, CA: RAND Corporation, 2016).

[259] United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009); International Committee of the Red Cross, *Guidelines on the Protection of the Natural Environment in Armed Conflict* (Geneva: ICRC, 2020).

5.6 Libya: oil terminals, militias and state fragmentation

Libya illustrates the relationship between fossil fuel revenue, weak state authority and armed competition. Since the fall of Muammar Gaddafi in 2011, Libya's oil sector has remained the country's central economic asset. Oil exports provide most state revenue, but political fragmentation has repeatedly turned oil infrastructure into a bargaining tool.[260]

Libya's oil terminals, fields and export routes have been contested by rival governments, militias, tribes, local groups and national institutions. Armed actors have blockaded ports, occupied facilities, disrupted production and used control over infrastructure to demand payments, recognition or political concessions. The result has been repeated output volatility, fiscal instability and weakening of state authority.[261]

The Libyan case shows how fossil fuel assets can become instruments of power in a fragmented state:

1. Oil terminals provide leverage because they connect domestic production to international revenue. A group that controls a terminal may not be able to sell oil lawfully by itself, but it can stop others from selling. The ability to block revenue gives it political power.
2. The centrality of oil revenue makes the whole state vulnerable. If exports stop, the budget suffers. Public salaries, subsidies and services become harder to fund. This increases pressure on political institutions.
3. Oil wealth can discourage compromise. Rival actors may believe that control of the state will eventually give them access to the main revenue stream. This raises the stakes of political competition.
4. External actors may become involved because oil supply, contracts and regional influence are at stake. Foreign support to local actors can prolong fragmentation.
5. Infrastructure damage and neglect can reduce long-term production capacity. Even temporary blockades can have lasting technical and financial consequences.[262]

Libya's National Oil Corporation has often been treated as one of the few institutions with national significance, but it has also been drawn into political disputes. Control over revenue distribution, central bank arrangements and export authority remains politically sensitive.

The Libyan case differs from Russia and ISIS. It is not primarily about a strong state using fossil revenue for external aggression, nor a non-state actor building a proto-state through captured oilfields. It is about a fragmented state in which oil remains the main prize and the

[260] World Bank, *Libya Economic Monitor: Spring 2025* (Washington, DC: World Bank, 2025); U.S. Energy Information Administration, *Country Analysis Brief: Libya* (Washington, DC: EIA, 2024).

[261] United Nations Security Council, *Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011)*, UN Doc. S/2024/914, 13 December 2024; Wolfram Lacher, *Libya's Fragmentation: Structure and Process in Violent Conflict* (London: I.B. Tauris, 2020).

[262] U.S. Energy Information Administration, *Country Analysis Brief: Libya* (Washington, DC: EIA, 2024); World Bank, *Libya Economic Monitor: Spring 2025* (Washington, DC: World Bank, 2025).

main source of leverage. Fossil fuel dependence does not produce centralised authoritarian resilience here; it contributes to contested sovereignty.[263]

For Europe, Libya matters because it is a nearby energy supplier and a source of wider Mediterranean instability. Disruption in Libya can affect oil markets and migration dynamics, and external competition over Libyan politics has broader regional consequences. A European policy focused only on securing oil supply would miss the deeper issue: Libya's oil-dependent political economy is part of its state-fragmentation problem.

The policy implication is that resource governance should be central to stabilisation. Transparent revenue distribution, protection of national energy institutions, depoliticisation of oil exports, anti-corruption mechanisms and local benefit-sharing are not technical reforms. They are conflict-prevention measures.[264]

5.7 Sudan and South Sudan: oil revenues, secession and conflict

Sudan and South Sudan illustrate how oil dependence, territorial division and transit infrastructure can create lasting instability. When South Sudan became independent in 2011, most oil reserves were located in the new state, while much of the export infrastructure remained dependent on Sudan. This created an interdependence marked by mistrust, revenue disputes and political fragility.[265]

South Sudan became one of the world's most oil-dependent states. Oil revenues have accounted for the overwhelming majority of government income and export earnings. This made the state extremely vulnerable to production disruptions, price fluctuations and transit disputes. Sudan, meanwhile, lost much of its oil production after secession but retained important pipeline and export infrastructure. The two states therefore depended on each other while also contesting revenue, border issues and security arrangements.[266]

The oil relationship affected conflict dynamics in several ways:

1. Revenue dependence raised the stakes of political control. In South Sudan, control over the state meant control over oil revenue. This contributed to elite competition and patronage politics.
2. Transit dependence created bargaining vulnerability. South Sudan's landlocked position meant it needed routes through Sudan to export oil. Disputes over transit fees and revenue-sharing could threaten the fiscal survival of the state.
3. Oil-producing regions became politically sensitive. Local grievances, militarisation and competition over benefit-sharing affected internal stability.

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[263] Wolfram Lacher, Libya's Fragmentation: Structure and Process in Violent Conflict (London: I.B. Tauris, 2020).

[264] Extractive Industries Transparency Initiative, EITI Standard 2023 (Oslo: EITI International Secretariat, 2023); Natural Resource Governance Institute, 2021 Resource Governance Index (New York: NRGI, 2021).

[265] World Bank, South Sudan Economic Monitor: Pathways to Sustainable Food Security (Washington, DC: World Bank, 2024); U.S. Energy Information Administration, Country Analysis Brief: Sudan and South Sudan (Washington, DC: EIA, 2024).

[266] World Bank, South Sudan Economic Monitor: Pathways to Sustainable Food Security (Washington, DC: World Bank, 2024); International Monetary Fund, Republic of South Sudan: 2024 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for the Republic of South Sudan, IMF Country Report No. 24/252 (Washington, DC: IMF, 2024).

4. Disruption to oil exports had immediate fiscal consequences. When production stopped or pipelines were affected, the state lost revenue rapidly, weakening public finances and increasing instability.
5. Dependence reduced policy flexibility. A government reliant on one revenue stream has limited capacity to withstand shocks.[267]

The Sudan/South Sudan case shows that fossil fuel dependence can be destabilising even without a conventional interstate war for oilfields. The problem lies in fiscal concentration, weak institutions, contested sovereignty and infrastructure dependence. Oil did not create all of South Sudan's political divisions, but it shaped the incentives of elites and the capacity of the state.

It also illustrates the importance of transit infrastructure. A landlocked producer may control reserves but not export routes. This gives transit states leverage and creates vulnerability to conflict in neighbouring territory. Recent disruption linked to the war in Sudan has affected South Sudanese oil exports, demonstrating how dependence on external infrastructure can transmit conflict across borders.[268]

For policy, the case supports three conclusions:

1. Fossil fuel-dependent new states require strong revenue governance from the outset. Without transparent institutions, oil revenue can intensify elite competition.
2. Transit arrangements must be politically robust. Pipelines crossing unstable regions create long-term vulnerability.
3. Economic diversification is a security priority. A state whose budget depends overwhelmingly on oil cannot easily absorb shocks or build accountable institutions.

Sudan and South Sudan therefore show how fossil fuel revenue can shape both interstate and internal conflict dynamics. The problem is not simply resource abundance. It is resource dependence under conditions of weak governance and contested infrastructure.

5.8 Iran: oil revenue, sanctions and regional proxy networks

Iran demonstrates the connection between oil revenue, sanctions pressure, state resilience and regional security policy. Oil and gas resources have long been central to Iran's economy and state finances. Sanctions have repeatedly restricted export capacity and access to revenue, but Iran has adapted through discounted sales, intermediaries, alternative shipping arrangements and regional networks.[269]

Iran's fossil fuel income matters for security in three ways:

[267] World Bank, South Sudan Economic Monitor: Pathways to Sustainable Food Security (Washington, DC: World Bank, 2024).

[268] Ibid.

[269] U.S. Energy Information Administration, Country Analysis Brief: Iran (Washington, DC: EIA, 2024); International Monetary Fund, Islamic Republic of Iran: 2025 Article IV Consultation — Press Release; Staff Report; and Statement by the Executive Director for the Islamic Republic of Iran, IMF Country Report No. 25/124 (Washington, DC: IMF, 2025).

1. It supports the state budget. Even under sanctions, oil and petroleum-related revenue remain important to Iran's fiscal position. Revenue affects the government's ability to fund subsidies, public salaries, security institutions and strategic programmes.
2. It provides foreign exchange. Hard currency is essential for imports, technology and external operations. Sanctions seek to restrict this flow, but circumvention networks can preserve part of it.
3. It contributes to regional influence. Iran's support for allied armed groups and political movements across the Middle East depends on a mix of ideological, military, logistical and financial factors. Oil revenue is not the only source of funding, but it forms part of the broader resource base available to the state.[270]

The relationship between oil and proxy networks is difficult to quantify. Money is fungible. A barrel of oil sold abroad does not directly map onto a particular shipment of weapons or a payment to a specific group. However, fossil revenue strengthens the fiscal capacity of the state, and that capacity supports strategic activity. The relevant claim is therefore structural rather than transactional: oil revenue helps sustain the state apparatus that conducts regional policy.[271]

Sanctions have attempted to reduce this capacity. Measures targeting Iranian oil exports, banking, shipping, insurance and petrochemicals aim to restrict revenue. Iran has responded through shadow trade, barter, intermediaries and alignment with buyers willing to resist or evade sanctions. This mirrors patterns seen in other sanctioned fossil fuel exporters.[272]

Iran also has chokepoint leverage through its position near the Strait of Hormuz. This gives it strategic influence beyond its own export volumes. Tensions involving Iran can affect oil prices because markets fear disruption to Gulf flows. Oil revenue and maritime leverage therefore reinforce each other.[273]

The Iranian case shows the limits and importance of sanctions. Sanctions can reduce revenue and constrain state capacity, but they rarely eliminate fossil income entirely. Over time, sanctioned states learn to adapt. Effective policy requires enforcement, maritime monitoring, financial intelligence and diplomatic pressure on buyers and intermediaries.

The case also supports the broader energy-transition argument. So long as global oil demand remains high, sanctioned producers will find buyers. Reducing oil dependence would weaken the ability of sanctioned states to monetise reserves and use energy markets to sustain strategic programmes.

[270] United States Department of the Treasury, Office of Foreign Assets Control, 'Iran Sanctions', accessed 4 June 2026; Congressional Research Service, Iran: Background and U.S. Policy (Washington, DC: CRS, latest edition used); Congressional Research Service, Iran Sanctions (Washington, DC: CRS, latest edition used).

[271] United States Department of the Treasury, Office of Foreign Assets Control, 'Iran Sanctions', accessed 4 June 2026; U.S. Energy Information Administration, *Country Analysis Brief: Iran* (Washington, DC: EIA, 2024).

[272] Ibid.

[273] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

5.9 Fossil fuel exports and military modernisation

Fossil fuel exports can support military modernisation by providing revenue, foreign exchange and industrial capacity. This does not mean that all fossil-funded defence spending is destabilising. States have legitimate security needs. However, where hydrocarbon revenues fund aggression, coercion or repression, they become a direct concern for international security.[274]

Military modernisation is expensive. It involves procurement of aircraft, missiles, air defence systems, naval platforms, armour, drones, communications, cyber capabilities and ammunition production. It also involves training, maintenance, logistics and personnel costs. Fossil fuel revenues can help sustain these expenditures, especially in states where the non-energy economy is weak.[275]

The relationship between fossil fuel exports and military modernisation has several dimensions:

1. Hydrocarbon exports generate fiscal surplus during high-price periods. Governments may use these windfalls to expand defence budgets.
2. Fossil exports provide hard currency. This allows states to buy weapons and components abroad.
3. Energy revenue can support domestic defence industries. State funds can be directed into research, production facilities and procurement contracts
4. Fossil revenue can reduce the pressure to choose between guns and butter. A state with high export income may fund both social spending and military expansion, at least temporarily.
5. Energy companies may be linked to strategic projects. State-owned firms can finance infrastructure, foreign partnerships or dual-use technology.[276]

Russia's military modernisation before and after 2014 was supported by the broader fiscal strength generated in part by energy exports. Oil and gas did not alone create Russian military capability, but they contributed to the resources available to the state. The war against Ukraine has further demonstrated that a fossil-exporting state may continue large-scale military spending even under sanctions if it preserves enough revenue and adapts its economy.[277]

Gulf states also demonstrate the relationship between hydrocarbon wealth and high defence expenditure. Their spending reflects regional security threats, alliance structures and

[274] Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[275] Stockholm International Peace Research Institute, *SIPRI Military Expenditure Database*, accessed 4 June 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[276] Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013); David S. Painter, *Oil and the American Century: The Political Economy of U.S. Foreign Oil Policy, 1941–1954* (Baltimore, MD: Johns Hopkins University Press, 1986).

[277] Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

strategic priorities, but the fiscal ability to sustain major procurement programmes is connected to oil and gas revenue.[278]

Iran shows a more constrained model. Sanctions have limited access to advanced imports, encouraging domestic production, asymmetric capabilities and proxy networks. Oil revenue remains relevant, but sanctions shape how it is used.[279]

The policy question is not whether fossil exporters should be prevented from all military spending. The issue is whether fossil revenue contributes to aggression, destabilising arms accumulation, internal repression or proxy warfare. Where it does, importing states and sanctioning coalitions have a legitimate interest in reducing the revenue stream.

This has implications for arms control, export controls and financial regulation. Fossil fuel revenue should be included in assessments of military capability. Defence analysts should track not only military expenditure but also the fiscal sources that sustain it. Energy analysts should consider whether export revenue is strengthening adversarial military capacity.

The link between fossil fuel exports and military modernisation also supports the case for demand reduction. A global reduction in oil and gas demand would lower the long-term revenue available to hydrocarbon-dependent military states. This would not automatically produce peace, but it would reduce one source of fiscal power for actors that use energy income to sustain coercive capability.

5.10 Implications for sanctions and conflict-prevention policy

The role of fossil fuels in war finance has direct implications for sanctions, conflict prevention and energy transition policy.

The first implication is that fossil fuel revenue should be treated as a strategic target where it finances aggression. Sanctions should focus on reducing the net revenue available to hostile or violent actors, not merely on symbolic trade bans. This requires attention to price, volume, shipping, insurance, intermediaries, refining and resale.[280]

The second implication is that sanctions must be designed to minimise perverse effects. If restrictions reduce supply but raise global prices sharply, the targeted state may preserve revenue while importers suffer. Price caps, phased embargoes, alternative supply arrangements and demand reduction can help manage this problem.

The third implication is that enforcement matters as much as design. Shadow fleets, ship-to-ship transfers, false documentation, opaque insurance, blending and third-country refining can undermine sanctions. Effective enforcement requires maritime surveillance, customs

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[278] Stockholm International Peace Research Institute, *Trends in World Military Expenditure, 2025*, SIPRI Fact Sheet, Stockholm, April 2026; International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016).

[279] U.S. Energy Information Administration, *Country Analysis Brief: Iran* (Washington, DC: EIA, 2024); United States Department of the Treasury, Office of Foreign Assets Control, 'Iran Sanctions', accessed 4 June 2026.

[280] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022.

data, financial intelligence, port-state control, penalties for violators and co-operation with non-EU partners.[281]

The fourth implication is that non-state oil finance must be addressed through local governance. Airstrikes or sanctions alone cannot eliminate illicit fuel economies. States must restore control over territory, offer legal livelihoods, secure borders, regulate fuel distribution and prevent corruption in security forces.[282]

The fifth implication is that post-conflict reconstruction must include resource governance. If oil terminals, fields and revenues remain contested, conflict may resume. Peace agreements in fossil-dependent states should include transparent revenue-sharing, independent oversight, local benefit mechanisms and anti-corruption controls.[283]

The sixth implication is that Europe should reduce fossil demand to increase sanctions flexibility. A Europe that depends less on imported oil and gas can apply revenue restrictions more effectively. Energy transition therefore strengthens foreign policy.

The seventh implication is that producer-country diversification should be part of conflict prevention. States heavily dependent on fossil revenues may become unstable as global demand declines. Transition finance, debt tools, economic diversification and governance reforms should be targeted at vulnerable producer states.[284]

The eighth implication is that environmental harm should be included in conflict finance analysis. Armed actors that profit from oil theft, illegal refining or sabotage may also cause severe pollution. Sanctions and accountability mechanisms should address both revenue and environmental damage.

The ninth implication is that fossil fuel infrastructure protection should not preserve dependency indefinitely. During transition, pipelines, refineries, ports and LNG terminals may remain necessary for security of supply. However, emergency fossil infrastructure should not become a justification for delaying demand reduction.

The tenth implication is that energy, sanctions and defence policy must be integrated. Fossil fuel revenue can finance armed forces; energy dependence can constrain sanctions; infrastructure attacks can create humanitarian crises; and transition policy can reduce strategic exposure. These issues cannot be managed separately.[285]

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[281] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[282] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015).

[283] World Bank, *Natural Resources and Violent Conflict: Options and Actions* (Washington, DC: World Bank, 2003); Extractive Industries Transparency Initiative, *EITI Standard 2023* (Oslo: EITI International Secretariat, 2023).

[284] International Monetary Fund, Economic Diversification in Oil-Exporting Arab Countries (Washington, DC: IMF, 2016); World Bank, Diversified Development: Making the Most of Natural Resources in Eurasia (Washington, DC: World Bank, 2014).

[285] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

The conclusion of this chapter is that fossil fuels finance war through both state and non-state pathways. They provide revenue, foreign exchange, logistical capacity and political resilience. They can sustain aggression even when they do not cause it. Reducing fossil fuel dependence is therefore not only an environmental objective. It is a means of limiting the financial power available to states and armed groups that use oil, gas and coal to sustain violence, coercion and instability.

Chapter 6

Chokepoints and Infrastructure Vulnerability

6.1 The geography of fossil fuel dependence

Fossil fuel dependence has a geography. Oil, gas and coal are not consumed where they are produced in equal measure. They move through wells, mines, pipelines, terminals, ports, refineries, storage sites, tankers, railways, power stations and electricity grids. These systems connect producers, transit states, maritime corridors and import-dependent economies. They also create points of exposure.[286]

The geography of fossil fuels differs from the geography of renewable energy. Solar and wind resources are unevenly distributed, and renewable systems require grids, storage, technology, manufacturing capacity and critical minerals. However, fossil fuel systems depend on concentrated reserves and large continuous flows of fuel. Oil and gas are extracted in specific locations, processed through specialised infrastructure and moved across long distances. If the route is blocked, the infrastructure damaged or the supplier unwilling, the consumer may face immediate economic and political consequences.[287]

This creates a central security problem. Fossil fuel systems concentrate risk. A crisis in one strait, pipeline corridor, port or LNG terminal can affect prices and supply far beyond the immediate area. A localised incident may transmit through global markets, shipping insurance, energy futures, industrial contracts, household bills and defence planning. Chokepoints turn geography into leverage.[288]

The geography of fossil fuel dependence operates at several levels.

At the global level, oil and LNG move through maritime chokepoints such as the Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits and the Strait of Malacca. These

[286] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, ‘Energy Security’, IEA, accessed 4 June 2026.

[287] International Energy Agency, ‘Energy Security’, IEA, accessed 4 June 2026; International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[288] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

routes are narrow, politically sensitive and vulnerable to military crisis, terrorism, piracy, state pressure, accidents, mining or blockade.[289]

At the regional level, pipelines connect producers and consumers through fixed corridors. Gas pipelines are especially significant because they can create long-term dependence on a specific supplier and route. Oil pipelines also matter where they carry exports from landlocked producers or bypass maritime routes.[290]

At the national level, refineries, storage facilities, ports, LNG terminals, compressor stations, interconnectors and electricity grids create critical nodes. A strike, accident, sabotage operation or cyberattack against one node can disrupt wider supply.[291]

At the local level, extraction sites and energy infrastructure can generate environmental damage, livelihood disruption and security grievances. Oilfields, pipelines and refineries may require protection, provoke protest or become targets for armed groups.[292]

The security risks created by this geography are not hypothetical. The Strait of Hormuz has been a recurring point of tension involving Iran, Gulf states, the United States and global energy markets. Houthi attacks in the Red Sea have disrupted shipping through Bab el-Mandeb and the Suez route. The blockage of the Suez Canal by the *Ever Given* in 2021 showed that even a non-military incident can disrupt global trade. The sabotage of Nord Stream in 2022 showed that undersea pipelines are vulnerable even in European waters. Russia's attacks on Ukrainian energy infrastructure have shown that power systems can become central targets in war.[293]

The strategic significance of fossil fuel geography lies not only in physical interruption. It also lies in expectation. Energy markets respond to risk. A threat to shipping can raise prices before a tanker is hit. A suspected pipeline vulnerability can affect storage behaviour. A refinery strike can raise product prices even if crude supply remains available. Insurance costs, shipping delays and rerouting decisions can multiply the effect of a local incident.[294]

For Europe, this geography has particular importance. The EU has reduced its dependence on Russian pipeline gas, but it remains dependent on imported oil, petroleum products and LNG. Greater reliance on LNG after 2022 has increased flexibility, but it has also increased

[289]U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[290] *Redivided Europe* (Cambridge, MA: Harvard University Press, 2020); European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[291] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[292] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

[293] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025).

[294] International Energy Agency, *Oil Market Report*, Paris: IEA, report series; European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

exposure to global LNG markets, tanker routes and maritime security. Diversification away from one supplier may shift risk rather than eliminate it.[295]

A secure energy strategy must therefore assess not only who supplies energy, but how it moves. The route, infrastructure, ownership, redundancy, storage and ability to substitute all matter. Fossil fuel dependence is not only a matter of volume. It is a matter of geography under pressure.

6.2 Maritime chokepoints and systemic risk

Maritime chokepoints are narrow passages through which large volumes of global trade and energy flows pass. They are strategically important because there are few alternatives. Ships may be able to reroute, but rerouting can add distance, time, fuel cost, insurance cost and operational risk. In some cases, there may be no practical alternative of comparable efficiency.[296]

For fossil fuels, chokepoints matter because oil and LNG remain heavily dependent on seaborne trade. A disruption at a chokepoint may not stop all supply, but it can alter market expectations, raise prices and require emergency planning. Even where physical volumes continue to move, the perceived risk can affect shipping behaviour.[297]

The principal maritime chokepoints relevant to fossil fuel security include the Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits, the Strait of Malacca and, in a wider sense, the Danish Straits for Baltic energy movement. Each has different geography, political context and vulnerability.[298]

Systemic risk arises because chokepoints connect several layers of dependence.

The first layer is physical flow. Large quantities of oil, LNG or petroleum products pass through the route. If the route is disrupted, volumes must be rerouted, replaced or delayed.

The second layer is market psychology. Traders and consumers anticipate disruption. Prices may rise before supply is materially reduced.

The third layer is insurance and finance. War-risk premiums, insurance restrictions and financing costs can alter shipping decisions.

The fourth layer is military response. Naval deployments, escorts, demining or deterrence missions may be required, raising the risk of escalation.

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[295] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Gas Market Report, Q1 2023* (Paris: IEA, 2023).

[296] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[297] International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[298] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

The fifth layer is political pressure. Governments face domestic concern over fuel prices, inflation and supply security.

The sixth layer is alliance cohesion. States exposed to the disruption may demand collective action; others may be less willing to bear costs.[299]

Chokepoints also create an asymmetry between the cost of disruption and the cost of defence. It may be relatively cheap for an actor to threaten shipping with mines, missiles, drones or fast boats. It is much more expensive to protect every vessel, patrol large maritime spaces, maintain air defence, gather intelligence and reassure markets.[300]

This is particularly relevant in the era of drones and precision missiles. Non-state actors can threaten shipping in ways that previously required state naval power. The Red Sea attacks illustrate this change. A group with sufficient missile and drone capability can impose costs on global shipping without controlling the sea in a conventional military sense.[301]

Maritime chokepoints also expose the limits of purely commercial energy policy. Shipping companies respond to risk, not only to state policy. If insurers raise premiums or major carriers suspend routes, energy and goods may reroute regardless of government preferences. Private-sector risk assessments therefore become part of national energy security.[302]

For Europe, chokepoint risk is not limited to direct energy imports. Europe is affected by global oil prices even when oil is sourced from elsewhere. LNG markets are increasingly interconnected. Container disruption affects industrial supply chains. A chokepoint crisis can therefore affect inflation, defence logistics and industrial production.[303]

Reducing fossil fuel demand is the most durable way to reduce exposure to chokepoint risk. Strategic reserves, naval deployments and diversification are necessary, but they manage vulnerability rather than remove it. A lower-oil, lower-gas economy is less vulnerable to the coercive potential of narrow maritime routes.

[299] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); International Maritime Organization, 'Maritime Security and Safety in the Red Sea and Gulf of Aden', IMO, accessed 4 June 2026.

[300] International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[301] Council of the European Union, 'Security and Freedom of Navigation in the Red Sea: Council Launches EUNAVFOR ASPIDES', 19 February 2024; European External Action Service, 'EUNAVFOR ASPIDES', accessed 4 June 2026.

[302] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[303] European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022; European Commission, Directorate-General for Economic and Financial Affairs, *European Economic Forecast: Spring 2023*, Institutional Paper 200 (Luxembourg: Publications Office of the European Union, 2023).

Chokepoint / corridor	Region	Main energy relevance	Principal risks	Typical wider effects
Strait of Hormuz	Persian Gulf	Major oil and LNG export outlet	Interstate crisis, tanker disruption, mining, missile attack	Global oil-price shock and shipping-risk premiums.
Bab el-Mandeb	Red Sea / Gulf of Aden	Energy and trade route to Suez	Drone and missile attacks, shipping disruption	Higher insurance costs and rerouting.
Suez Canal / SUMED	Egypt	Europe–Asia trade and energy corridor	Blockage, conflict spillover, rerouting	Delays, higher freight costs, energy-market stress.
Turkish Straits	Black Sea / Mediterranean	Black Sea oil and regional trade flows	Congestion, war spillover, accident risk	Regional export disruption.
Strait of Malacca	Southeast Asia	Key route for Gulf energy exports to Asia	Congestion, piracy, strategic rivalry	Supply-chain delays and Asian market exposure.
Danish Straits	Baltic Sea	Baltic maritime access and oil shipments	Naval incidents, security tensions	Regional export and shipping disruption.

Table 6. Major maritime chokepoints and associated risks

6.3 The Strait of Hormuz

The Strait of Hormuz is the most significant oil chokepoint in the world. It connects the Persian Gulf with the Gulf of Oman and the wider Indian Ocean. Major exporters including Saudi Arabia, Iraq, Kuwait, the United Arab Emirates, Qatar and Iran depend on the strait for access to global markets. Qatar's LNG exports also pass through this route, giving Hormuz importance for both oil and gas.[304]

The strategic significance of Hormuz derives from concentration. A large share of global seaborne oil and LNG flows through a narrow passage bordered by Iran and Oman. Any disruption would affect global markets immediately. It would also have consequences for Asian importers, European energy prices, shipping insurance and military planning.[305]

The principal risks around Hormuz include interstate confrontation, Iranian threats to shipping, tanker seizures, mining, missile attacks, drone strikes, naval incidents, miscalculation and regional war. Even limited incidents can affect markets because of the route's importance.[306]

[304] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[305] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[306] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

Iran's position gives it potential leverage. It cannot easily close Hormuz for a long period without provoking major military response and harming its own interests. However, it does not need to sustain a full closure to create pressure. Harassment, seizures, military exercises, missile tests or threats can be enough to raise risk premiums. In this sense, Hormuz is a classic example of coercion through uncertainty.[307]

Hormuz also illustrates the connection between fossil fuel geography and military presence. External naval powers have long maintained a role in Gulf security because energy flows through the strait affect global markets. Maritime surveillance, mine-countermeasure capacity, escort operations and deterrence are central to maintaining confidence.[308]

The vulnerability of Hormuz cannot be understood only as a regional issue. A disruption would affect countries far from the Gulf. Oil is globally priced. A shock in Hormuz would affect transport costs, petrochemicals, agriculture, aviation, shipping and military fuel. LNG disruption could affect gas prices, particularly for states relying on spot cargoes.[309]

The European security implication is indirect but significant. Europe has reduced reliance on Russian pipeline gas partly by increasing LNG imports. While much of Europe's LNG comes from a range of suppliers, global LNG markets remain interconnected. Disruption to Qatari exports through Hormuz could tighten supply and raise prices. Similarly, any oil shock would affect European consumers regardless of direct import origin.[310]

The policy response requires several layers.

The first is maritime security. Mine-countermeasure capacity, surveillance, naval presence and crisis communication remain necessary.

The second is strategic reserves. Oil stocks can cushion short-term disruption, though they cannot solve a prolonged crisis.

The third is diversification. Alternative suppliers and routes reduce exposure, but only partially.

The fourth is demand reduction. Lower oil and gas demand reduces the economic effect of Hormuz disruptions.

The fifth is diplomacy. De-escalation mechanisms in the Gulf can reduce the probability of crisis.[311]

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[307] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[308] International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026); NATO, 'Maritime Security', NATO, accessed 4 June 2026.

[309] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[310] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[311] International Energy Agency, 'Oil Security and Emergency Response', IEA, accessed 4 June 2026; U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

Hormuz demonstrates the central argument of this chapter. Fossil fuel dependence allows a narrow geographic space to carry global strategic consequences. The route is important because the world remains heavily dependent on oil and LNG. A transition away from fossil fuels would not make the Gulf irrelevant, but it would reduce the degree to which one strait can affect global economic and security stability.

6.4 Bab el-Mandeb and the Red Sea

Bab el-Mandeb is the maritime passage between Yemen, Djibouti and Eritrea. It connects the Gulf of Aden with the Red Sea and the Suez Canal route. It is a critical corridor for trade between Europe and Asia, including oil, petroleum products, LNG and container traffic. Disruption at Bab el-Mandeb affects both energy security and wider supply chains.[312]

The Red Sea crisis associated with Houthi attacks has demonstrated the strategic vulnerability of this route. Missile and drone attacks, attempted seizures and threats to shipping have led many commercial vessels to avoid the Red Sea and reroute around the Cape of Good Hope. This adds time, fuel cost, insurance cost and logistical complexity.[313]

The Bab el-Mandeb case is significant because it shows that a non-state actor can influence a global chokepoint. The Houthis do not need to control the strait physically. They can create sufficient risk to alter shipping behaviour. This is a form of coercion through denial and uncertainty.[314]

The disruption has several consequences:

1. It raises shipping costs. Longer routes consume more fuel and require more vessel days.
2. It delays cargoes. Supply chains dependent on predictable delivery schedules are affected.
3. It raises insurance costs. War-risk premiums increase the cost of operating in the area.
4. It affects energy transport. Oil, petroleum products and LNG movements through the Red Sea may be reduced, delayed or rerouted.
5. It increases naval demands. States must consider escorts, patrols, air defence and strikes against launch sites.
6. It creates escalation risk. Military responses to attacks may widen the conflict or draw in additional actors.[315]

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[312] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[313] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); Council of the European Union, 'Security and Freedom of Navigation in the Red Sea: Council Launches EUNAVFOR ASPIDES', 19 February 2024; European External Action Service, 'EUNAVFOR ASPIDES', accessed 4 June 2026.

[314] International Maritime Organization, 'Maritime Security and Safety in the Red Sea and Gulf of Aden', IMO, accessed 4 June 2026.

[315] European External Action Service, 'EUNAVFOR ASPIDES', accessed 4 June 2026; International Maritime Organization, 'Maritime Security and Safety in the Red Sea and Gulf of Aden', IMO, accessed 4 June 2026.

The Red Sea case also shows that fossil fuel vulnerability is linked to broader commercial vulnerability. Even if energy cargoes are only part of the affected traffic, energy markets react because route disruption is a signal of wider instability. Container disruption can also affect the energy transition, including components for renewable energy systems, electronics, machinery and industrial goods.[316]

For Europe, Bab el-Mandeb matters because it sits on the route to the Suez Canal. The route is central to trade with Asia and to certain energy flows. Rerouting around Africa is possible, but costly. In a prolonged crisis, higher shipping costs can affect inflation and industrial competitiveness.[317]

The route is also politically complex. It lies near Yemen's war, the Horn of Africa, the Gulf of Aden and major naval operating areas. Piracy, civil war, state failure, regional rivalry and proxy dynamics intersect. The security of the route cannot be separated from regional conflict resolution.

The policy implications are clear. Maritime protection is necessary but insufficient. Naval operations can reduce immediate risk, but the underlying conflict dynamics remain. Intelligence-sharing, sanctions on weapons transfers, diplomatic efforts, port security and regional partnerships are also required.[318]

Energy resilience must account for non-state threats. Traditional energy security focused heavily on producer states and interstate conflict. Bab el-Mandeb shows that armed groups can disrupt energy routes without owning energy resources. Reducing oil and gas dependence remains the long-term answer. A lower-fossil economy would still depend on maritime trade, but its exposure to energy-price shocks from Red Sea disruption would be reduced.

6.5 The Suez Canal and global trade disruption

The Suez Canal is one of the world's most important maritime corridors. It connects the Red Sea with the Mediterranean and provides the shortest sea route between Europe and Asia. For energy markets, it is linked with oil, petroleum products and LNG flows, often in combination with the SUMED pipeline. For global trade, it is central to container traffic and industrial supply chains.[319]

The Suez Canal is vulnerable in a different way from Hormuz or Bab el-Mandeb. It is not primarily a site of ongoing military confrontation, although regional instability can affect it.

[316] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

[317] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

[318] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats, JOIN(2023) 8 final, Brussels, 10 March 2023; European External Action Service, 'EUNAVFOR ASPIDES', accessed 4 June 2026.

[319] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

Its vulnerability is also physical and operational. The grounding of the *Ever Given* in March 2021 blocked the canal and caused global shipping delays. This was not an act of war, yet it demonstrated that a single incident in a narrow passage can disrupt world trade.[320]

The Suez case is important because it shows that chokepoint vulnerability does not require hostile intent. Accidents, technical failures, weather, congestion or operational mistakes can have systemic effects. When combined with geopolitical risk in the Red Sea, the route becomes even more sensitive.[321]

For energy security, the Suez route matters because it connects European markets with Gulf and Asian flows. Oil and LNG can be rerouted around the Cape of Good Hope, but this adds distance and cost. The SUMED pipeline provides an alternative for some oil flows, but it does not eliminate route dependence.[322]

The canal also matters for inflation and industrial resilience. If shipping delays increase costs for goods, components and raw materials, the effects spread through the economy. Energy transition technologies may also be affected, since solar components, batteries, electronics and industrial equipment move through global shipping routes.[323]

The strategic lesson is that fossil fuel security cannot be separated from trade security. Energy commodities move through the same maritime system as manufactured goods. A crisis that begins as a shipping issue can become an energy issue; a crisis that begins as an energy-route threat can become a broader supply-chain problem.

Suez also illustrates why redundancy matters. A resilient system has alternative routes, stockpiles, diversified supply chains and flexible logistics. However, redundancy is expensive. Commercial systems often optimise for efficiency rather than resilience. The canal's role in global trade reflects decades of cost minimisation and just-in-time logistics. Security policy must therefore account for the gap between commercial efficiency and strategic resilience.[324]

For Europe, the Suez route reinforces the argument for reducing dependence on seaborne fossil fuels and strengthening industrial resilience. Lower oil and gas dependence would reduce exposure to energy shocks, while diversified industrial supply chains would reduce exposure to wider trade disruption.

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[320] Successfully Refloats the Panamanian Container Ship EVER GIVEN', 29 March 2021; United Nations Conference on Trade and Development, *Review of Maritime Transport 2021* (Geneva: United Nations, 2021).

[321] Ibid.

[322] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[323] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[324] World Bank, *World Development Report 2020: Trading for Development in the Age of Global Value Chains* (Washington, DC: World Bank, 2020); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

6.6 The Turkish Straits and Black Sea energy routes

The Turkish Straits — the Bosporus and the Dardanelles — connect the Black Sea with the Mediterranean. They are strategically significant for oil exports from the Black Sea region, including flows linked to Russia, Kazakhstan and other producers. They also sit within a politically sensitive maritime environment shaped by Russia's war against Ukraine, Turkish policy, NATO interests and Russian naval activity.[325]

The Turkish Straits differ from Hormuz and Bab el-Mandeb because they are governed through a specific legal and geopolitical framework, including Turkey's role under the Montreux Convention. They are also narrow, busy and environmentally sensitive. Tanker traffic through the Bosporus passes close to Istanbul, creating accident and pollution risks.[326]

Black Sea energy routes have become more important since Russia's full-scale invasion of Ukraine. The war has affected shipping, ports, naval operations, grain exports, energy infrastructure and regional security. Russian oil exports, Kazakh oil routes, Ukrainian ports and energy facilities all sit within a wider conflict environment.[327]

Several vulnerabilities are relevant:

1. The straits are physically narrow and congested. Accidents involving tankers could have severe environmental and economic effects.
2. The Black Sea is militarised. The presence of war, mines, naval assets and missile threats increases risk.
3. Pipelines and export terminals in the wider region are exposed to political pressure. Landlocked producers such as Kazakhstan may depend on routes crossing Russian territory or using Russian-controlled infrastructure.
4. Sanctions can alter traffic patterns. Restrictions on Russian oil, insurance and shipping may change the risk profile of vessels using the region.
5. Turkey's role is strategically important. As a NATO member with control over the straits and relations with Russia, Ukraine, the EU and regional states, Turkey occupies a central position.[328]

The Turkish Straits illustrate how fossil fuel transit can intersect with alliance politics. Energy flows through the Black Sea are not merely commercial. They affect Russia's revenue, Central Asian export options, European supply diversification and regional security. Decisions about routes, insurance, sanctions and port access all have strategic implications.

[325] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); NATO, *Strategic Concept 2022* (Brussels: NATO, 2022).

[326] Convention Regarding the Regime of the Straits, signed at Montreux, 20 July 1936, entered into force 9 November 1936, *League of Nations Treaty Series*, vol. 173, pp. 213–241; International Maritime Organization, 'Oil Tanker Safety', IMO, accessed 4 June 2026; International Maritime Organization, 'Prevention of Pollution by Oil', IMO, accessed 4 June 2026.

[327] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025); International Energy Agency, 'Ukraine's Energy Security and the Coming Winter', IEA, accessed 4 June 2026.

[328] International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

The environmental risk is also significant. A tanker accident in the Bosporus or a strike on Black Sea energy infrastructure could cause large-scale pollution. War increases the probability of such incidents. As in other chokepoints, the infrastructure is both economically essential and environmentally hazardous.[329]

For Europe, Black Sea energy security is linked to the wider security of Ukraine, Turkey, the South Caucasus and Central Asia. Diversification away from Russia may require alternative routes across the Caspian and South Caucasus, but those routes also have political and infrastructure risks. A secure strategy must therefore combine energy diversification with regional diplomacy and infrastructure protection.

6.7 The Strait of Malacca and Asian energy security

The Strait of Malacca is one of the world's most important maritime routes. It connects the Indian Ocean with the South China Sea and is central to energy flows from the Middle East and Africa to East Asia. China, Japan, South Korea and other Asian economies rely heavily on this route for oil and LNG imports.[330]

Although the Strait of Malacca is geographically distant from Europe, it matters for global security. Asian energy demand affects global oil and gas markets. A disruption in Malacca would raise prices, affect shipping, increase demand for alternative routes and potentially intensify regional military competition. Europe would feel the effects through global market prices and supply-chain disruption.[331]

Malacca illustrates the global nature of fossil fuel dependence. A chokepoint serving Asian importers can affect European inflation because oil is globally priced. Similarly, LNG disruption in Asia can redirect cargoes and affect European gas markets. Energy security is therefore interconnected across regions.[332]

The main risks around Malacca include congestion, piracy, accidents, great-power rivalry, terrorism and regional tensions in the South China Sea. The route is narrow at points and extremely busy. Alternatives exist, such as the Lombok and Sunda straits, but they add distance and cost.[333]

For China, dependence on Malacca has long been viewed as a strategic vulnerability, sometimes described as the "Malacca dilemma". This has influenced Chinese interest in

[329] United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009); International Maritime Organization, 'Oil Pollution Preparedness, Response and Cooperation', IMO, accessed 4 June 2026.

[330] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[331] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[332] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[333] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Maritime Organization, 'Maritime Security', IMO, accessed 4 June 2026.

alternative routes, pipelines, ports, overseas investments and naval capability. Energy insecurity can therefore shape major-power strategy.[334]

For Japan and South Korea, Malacca is also vital because both are major energy importers with limited domestic fossil fuel resources. Their dependence on imported oil and LNG makes maritime security central to national strategy.

The Strait of Malacca shows that fossil fuel dependence can drive naval planning even outside conflict. States seek to protect routes before crisis occurs. Maritime energy security influences port investments, alliance relationships, naval deployments and strategic infrastructure.

For Europe, the indirect lesson is important. A fossil-dependent world requires permanent military and diplomatic attention to distant chokepoints. Reducing oil and gas demand would not eliminate the need for maritime security, but it would reduce the extent to which economic stability depends on fossil flows through narrow routes.

Malacca also foreshadows a transition-related issue. Clean technology supply chains, including solar panels, batteries, electronics and critical minerals, also move through Asian maritime routes. Energy transition will therefore not eliminate maritime vulnerability. It will change what is being transported. The policy challenge is to reduce the most coercible fossil dependencies while diversifying clean technology supply chains and shipping routes.[335]

[334] Andrew S. Erickson and Gabriel B. Collins, 'China's Oil Security Pipe Dream: The Reality, and Strategic Consequences, of Seaborne Imports', *Naval War College Review*, vol. 63, no. 2, 2010, pp. 89–112.

[335] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024).

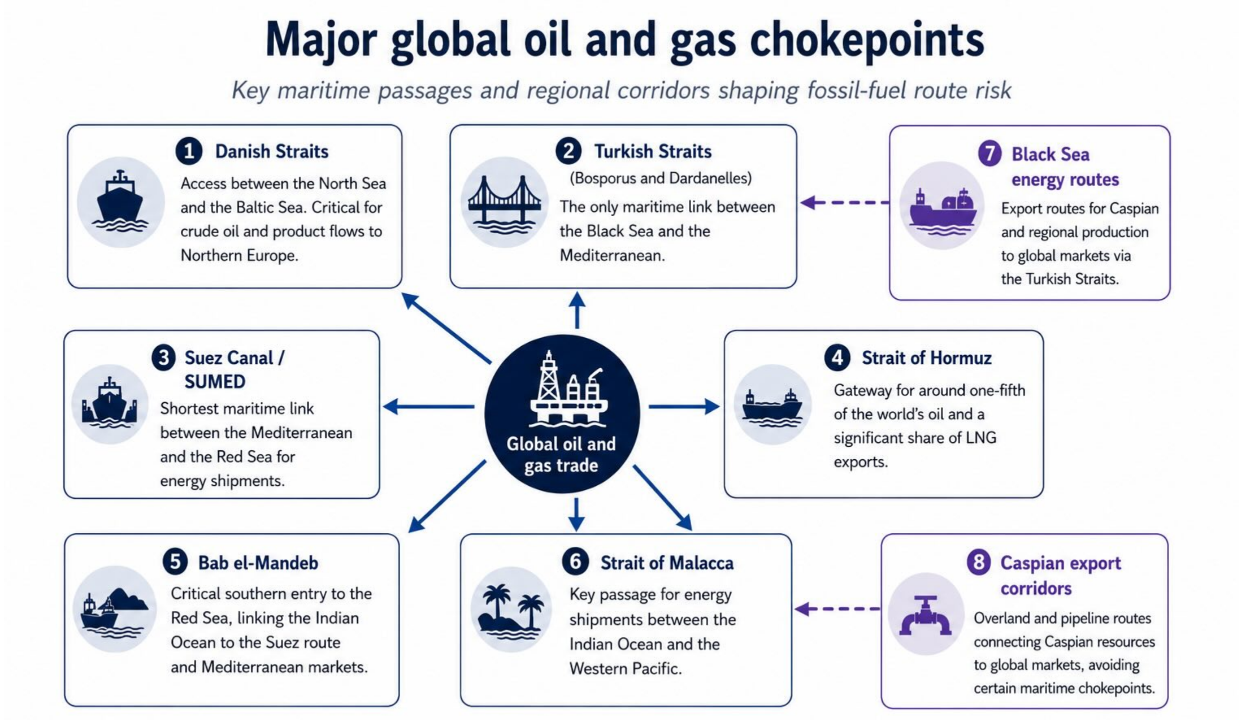

Figure 3. Major global oil and gas chokepoints. Fossil fuel trade depends on a limited number of maritime passages and infrastructure corridors. Disruption at one route can affect prices, insurance costs, shipping decisions and political stability.

6.8 Pipelines as strategic assets

Pipelines are among the most strategically significant forms of fossil fuel infrastructure. They are fixed, expensive, long-term assets that connect specific producers, transit states and consumers. Unlike tankers, they cannot be rerouted quickly. This gives pipelines both economic efficiency and strategic rigidity.[336]

A pipeline creates a relationship between geography and politics. It determines who can supply whom, who earns transit revenue, who can interrupt flows and who becomes dependent. It can strengthen alliances or deepen vulnerabilities. It can integrate markets or divide them. It can bypass states, weakening their strategic position. It can also create incentives for external powers to intervene in route politics.[337]

Pipelines are strategic assets for several reasons:

1. They move large volumes continuously. This makes them economically important and difficult to replace at short notice.

[336] Thane Gustafson, The Bridge: Natural Gas in a Redivided Europe (Cambridge, MA: Harvard University Press, 2020); European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[337] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

2. They are linear and exposed. Long routes cross borders, seas, conflict zones, mountains and politically sensitive regions. They can be sabotaged, bombed, tapped or shut down.
3. They require long-term contracts. This can create dependence and reduce flexibility.
4. They generate transit power. States through which pipelines pass may gain revenue and leverage.
5. They shape geopolitical alignment. A pipeline route can pull producers and consumers into lasting strategic relationships.
6. They can become targets in hybrid conflict. Sabotage, cyberattack, legal pressure, regulatory obstruction and disinformation can all affect pipeline systems.[338]

The strategic nature of pipelines is especially clear in gas markets. Gas pipelines are capital-intensive and usually connect fixed markets. If a state depends on one supplier through one route, its vulnerability is high. LNG can reduce this dependency, but only if terminals, contracts and shipping are available.[339]

Oil pipelines are also strategic, especially for landlocked producers. Kazakhstan, Azerbaijan, Iraq's northern exports and South Sudan all illustrate the importance of route politics. A landlocked oil producer may own reserves but depend on another state for access to the sea. That transit dependence can become a source of pressure.[340]

Pipelines also raise environmental risks. Leaks, explosions, sabotage and wartime damage can contaminate land and water. Undersea pipelines can release methane or hydrocarbons if damaged. Repair may be technically difficult in conflict zones or deep waters.[341]

The following sub-sections examine three pipeline cases: Druzhba, Nord Stream and South Caucasus pipelines.

6.8.1 Druzhba

The Druzhba pipeline system is one of the major oil pipeline networks linking Russia with parts of Central and Eastern Europe. Built during the Soviet era, it reflected the energy

[338] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[339] International Energy Agency, Gas Market Report, Q4 2022 (Paris: IEA, 2022); European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[340] World Bank, *South Sudan Economic Monitor: Pathways to Sustainable Food Security* (Washington, DC: World Bank, 2024); U.S. Energy Information Administration, *Country Analysis Brief: Kazakhstan* (Washington, DC: EIA, 2024); U.S. Energy Information Administration, *Country Analysis Brief: Azerbaijan* (Washington, DC: EIA, 2024); U.S. Energy Information Administration, *Country Analysis Brief: Iraq* (Washington, DC: EIA, 2024).

[341] United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009); United Nations Environment Programme, 'UNEP Estimates Methane Emissions from Nord Stream Gas Pipeline Leaks', UNEP, 30 September 2022.

geography of the Eastern Bloc and later became part of post-Cold War European oil supply.[342]

Druzhba illustrates inherited infrastructure dependency. After the collapse of the Soviet Union, several European states remained physically connected to Russian crude through pipeline systems designed in a different political era. Refineries in some countries were configured for Russian crude grades, making rapid substitution difficult. This created a specific form of dependence even where alternative oil could theoretically be bought on world markets.[343]

The pipeline's strategic significance increased after Russia's invasion of Ukraine. EU sanctions on Russian oil required exemptions and transitional arrangements for some pipeline-dependent states. This created political tension within the EU because Member States had different exposure levels and different capacities to replace supply.[344]

Druzhba demonstrates that infrastructure can constrain sanctions policy. A state dependent on pipeline crude may seek exemptions, delays or compensation. This can affect EU unity. The issue is not merely political willingness; it is also physical and industrial adaptation. Refineries, storage, ports and alternative pipelines may need investment.

The pipeline also shows that energy dependence has a legacy dimension. Infrastructure built decades earlier can shape contemporary policy. Once a refinery, pipeline and supply relationship are established, changing them requires time and money. Strategic vulnerability is therefore often accumulated gradually.

For Europe, Druzhba's lesson is that energy infrastructure must be reviewed through a security lens before crisis. Waiting until a supplier becomes openly hostile makes adaptation more expensive. Diversification, refinery flexibility, port access and emergency planning should be developed in advance.

6.8.2 Nord Stream

Nord Stream has already appeared in this White Paper as a case of strategic dependency and infrastructure vulnerability. It deserves attention here as a pipeline asset.

The Nord Stream pipelines connected Russia directly to Germany through the Baltic Sea. The route bypassed Ukraine, Poland and the Baltic states. Supporters presented it as a direct and

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[342] U.S. Energy Information Administration, *Country Analysis Brief: Russia* (Washington, DC: EIA, 2024); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026.

[343] European Commission, 'Sanctions Adopted Following Russia's Military Aggression against Ukraine', European Commission, accessed 4 June 2026; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[344] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; European Commission, 'Frequently Asked Questions on EU Restrictive Measures against Russia', European Commission, accessed 4 June 2026.

efficient gas route. Critics argued that it increased dependence on Russia, divided Europe and weakened Ukraine's transit role.[345]

The strategic problem was not only the gas volume. It was the political effect of route choice. By bypassing Ukraine, Nord Stream reduced the importance of Ukrainian transit. This potentially gave Russia more freedom to pressure Ukraine without endangering supply to Western Europe. The project therefore had consequences for European security beyond energy prices.[346]

The sabotage of Nord Stream in September 2022 transformed the pipeline into a symbol of undersea infrastructure vulnerability. The explosions damaged pipelines in the Baltic Sea and prompted wider concern about protection of subsea assets. Undersea pipelines are difficult to monitor, and attribution of attacks can be politically complex. The incident occurred in a context of war, sanctions and hybrid threats, making it a landmark event in European infrastructure security.[347]

Nord Stream offers several lessons:

1. Infrastructure decisions can divide allies if strategic risks are assessed differently.
2. Direct routes are not automatically more secure. They may reduce transit risk while increasing supplier dependence.
3. Undersea energy infrastructure is vulnerable to sabotage.
4. Once built, major infrastructure creates political and economic pressure to use it, even when strategic concerns grow.
5. Infrastructure can outlive the assumptions under which it was justified.

Nord Stream is therefore a case study in the danger of treating energy infrastructure as purely commercial. A pipeline can change regional power relations, alliance cohesion and crisis options. Security review should be mandatory for infrastructure that creates long-term dependence on strategic competitors.

6.8.3 South Caucasus pipelines

The South Caucasus is a key corridor for moving Caspian oil and gas westward without passing through Russia or Iran. Pipelines such as Baku-Tbilisi-Ceyhan and the South Caucasus gas pipeline, connected to the wider Southern Gas Corridor, have strategic significance because they diversify routes towards Turkey and Europe.[348]

These pipelines illustrate the security value of route diversification. They allow Azerbaijan and Caspian resources to reach international markets through Georgia and Turkey. For

[345] Katja Yafimava, 'Gas Directive Amendment: Implications for Nord Stream 2', Oxford Institute for Energy Studies, March 2019; Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020).

[346] Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020).

[347] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[348] European Commission, 'Southern Gas Corridor', European Commission, accessed 4 June 2026; U.S. Energy Information Administration, *Country Analysis Brief: Azerbaijan* (Washington, DC: EIA, 2024).

Europe, they provide a non-Russian energy route. For Georgia and Turkey, they increase transit importance. For Azerbaijan, they strengthen export autonomy.[349]

However, the route also has vulnerabilities. The South Caucasus contains unresolved conflicts, border tensions, Russian influence, Turkish regional interests and proximity to Iran. Infrastructure passing through this region could be exposed to military escalation, sabotage, cyberattack or political pressure. The 2020 and 2023 conflicts around Nagorno-Karabakh, as well as wider regional tensions, show that the area cannot be treated as a low-risk corridor.[350]

South Caucasus pipelines therefore show the dual nature of diversification. They reduce dependence on one route or supplier but introduce exposure to another region. This does not mean diversification is wrong. It means diversification must be accompanied by political risk assessment, infrastructure protection and conflict-prevention diplomacy.[351]

The long-term question is also important. Europe may need some non-Russian gas during transition, but it should avoid creating new long-term fossil dependencies that conflict with decarbonisation. Infrastructure designed for fossil diversification should be assessed for future compatibility, including possible hydrogen conversion where technically and economically credible, though such claims require careful scrutiny.[352]

The South Caucasus case demonstrates that pipeline politics is not only about Russia. Any fixed infrastructure through a contested region creates strategic relationships and vulnerabilities. Energy policy, regional diplomacy and security planning must be integrated.

6.9 LNG terminals, refineries, ports and storage facilities

Pipelines are not the only vulnerable assets in fossil fuel systems. LNG terminals, refineries, ports and storage facilities are critical nodes. They concentrate energy flows and are difficult to replace quickly. Damage to one facility can affect supply, prices and industrial operations over a wide area.[353]

LNG terminals increased in importance for Europe after 2022. They allowed Member States to import gas from global markets and reduce reliance on Russian pipelines. Floating storage and regasification units provided relatively rapid flexibility. However, LNG terminals also create new vulnerabilities.[354]

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[349] European Commission, 'Southern Gas Corridor', European Commission, accessed 4 June 2026; International Energy Agency, 'Azerbaijan Energy Profile', IEA, accessed 4 June 2026.

[350] International Crisis Group, *Nagorno-Karabakh: Seeking a Path to Peace in the Ukraine War's Shadow*, Europe Report No. 264, 22 April 2022.

[351] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[352] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *Global Hydrogen Review 2024* (Paris: IEA, 2024); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[353] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[354] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

An LNG terminal can be targeted physically or by cyber means. It may depend on a small number of berths, storage tanks, regasification units, control systems and pipeline connections. It may be located near urban or industrial areas. It depends on shipping, port operations, dredging, maritime security and global cargo availability. A major incident could affect supply and public confidence.[355]

Refineries are another critical node. Crude oil must be processed into usable products such as diesel, petrol, jet fuel, heating oil and petrochemical feedstocks. A country may import crude but lack enough refining capacity, or possess refineries configured for particular crude grades. Attacks on refineries can create shortages of specific fuels even if crude supply remains available.[356]

Ports are equally important. Energy imports often pass through specialised port facilities. Oil terminals, coal terminals and LNG berths require storage, pumps, pipelines, safety systems and customs control. Port disruption can affect energy, food, military logistics and industrial supply chains simultaneously.[357]

Storage facilities are strategic buffers. Oil stocks, gas storage, petroleum-product reserves and coal stockpiles allow states to absorb temporary disruption. However, storage can also be vulnerable. Tanks can be attacked. Gas storage can be underfilled. Ownership structures may create security concerns. Cyberattacks can disrupt operations.[358]

The 2022 European gas crisis showed the importance of storage. Ensuring high storage levels before winter became a central policy objective. Storage was no longer treated as a commercial optimisation tool; it became a matter of strategic resilience.[359]

The vulnerability of these nodes has several policy implications:

1. Critical energy infrastructure should be mapped and prioritised. Governments need a clear understanding of which assets are essential to national and regional supply.
2. Physical security must be upgraded. Drones, missiles, sabotage teams and insider threats all require attention.
3. Cyber security is central. Modern terminals, refineries and storage sites rely on digital control systems.
4. Redundancy is necessary. A system dependent on one terminal or refinery is more vulnerable than one with alternative capacity.

[355] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[356] International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025); U.S. Energy Information Administration, *Refining and Petroleum Products*, EIA, accessed 4 June 2026.

[357] United Nations Conference on Trade and Development, *Review of Maritime Transport 2024* (Geneva: United Nations, 2024); International Maritime Organization, 'Maritime Security', IMO, accessed 4 June 2026.

[358] International Energy Agency, 'Oil Security and Emergency Response', IEA, accessed 4 June 2026; Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

[359] Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

5. Public-private co-operation is essential. Many energy assets are owned or operated by private companies, but their failure has national security consequences.
6. Transition planning must avoid stranded but still critical assets. During transition, some fossil infrastructure remains necessary for resilience. Governments must manage decline without creating supply gaps or overinvesting in assets that prolong dependence.[360]

LNG terminals, refineries, ports and storage sites are therefore not peripheral to the security argument. They are the nodes through which fossil fuel dependence becomes operational vulnerability.

Asset type	Typical function	Main vulnerabilities	Illustrative consequences
Pipelines	Transport oil or gas over long distances	Sabotage, leaks, explosion, political transit pressure	Supply disruption and repair delays.
LNG terminals	Import, regasification or export of liquefied natural gas	Drone or missile attack, fire, cyberattack, port disruption	Loss of import capacity and price spikes.
Refineries	Process crude oil into fuels	Fire, air attack, technical damage, power loss	Product shortages and economic disruption.
Ports and oil terminals	Load, unload and store fossil fuels	Blockade, strike, sabotage, accident	Trade interruption and local contamination.
Storage depots	Hold strategic or commercial fuel stocks	Fire, explosion, drone attack	Local shortages and emergency drawdown.
Offshore platforms and facilities	Extract offshore oil and gas or connect offshore energy networks	Maritime attack, storm damage, technical failure	Production loss and safety risks.
Electricity grids and interconnectors	Move electricity across regions and borders	Cyberattack, physical strike, transformer failure	Blackouts and reduced system resilience.
Undersea cables and pipelines	Carry data or energy across seabeds	Sabotage, anchor damage, hard-to-detect interference	Complex repair and strategic uncertainty.

Table 7. Energy infrastructure vulnerabilities by asset type

6.10 Sabotage, drones, mines and hybrid threats

Modern energy infrastructure is vulnerable to a wider range of threats than traditional state blockade. Sabotage, drones, mines, cyberattacks, disinformation, legal pressure and covert operations can all affect energy systems. These threats are often described as hybrid because

[360] European Commission, REPowerEU Plan, COM(2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

they operate below the threshold of declared war or combine military, civilian, criminal and informational methods.[361]

Sabotage can target pipelines, undersea cables, compressor stations, substations, storage tanks, railway lines, port equipment or control systems. It may be conducted by state agents, proxy groups, criminals, terrorists or insiders. Attribution may be difficult, especially underwater or in conflict zones. Ambiguity can be part of the strategy.[362]

Drones have changed infrastructure vulnerability. Cheap drones can conduct surveillance, carry explosives, overwhelm defences or guide attacks. Long-range drones can strike refineries, depots and power stations far from the front line. Drone attacks on oil facilities in Saudi Arabia in 2019 demonstrated that centralised energy infrastructure can be highly vulnerable to precision attack. Russia's war against Ukraine has further normalised drone attacks on energy systems.[363]

Mines remain a threat to maritime energy routes. Mining a chokepoint or port approach can disrupt shipping even without sinking vessels. Mine clearance is slow and specialised. The mere suspicion of mines can change shipping behaviour.[364]

Cyber threats are increasingly important. Energy infrastructure depends on industrial control systems, communications networks, sensors, scheduling software and market platforms. Cyberattacks can disrupt operations, damage equipment, manipulate data or create uncertainty. Electricity grids are particularly exposed because digital control and balancing systems are essential to operation.[365]

Hybrid threats may also target public confidence. Disinformation about energy shortages, price manipulation, infrastructure damage or policy failure can increase political pressure. Energy fear is a powerful tool because it affects households directly.

Undersea infrastructure is a growing concern. Pipelines, electricity interconnectors and data cables lie across seabeds that are difficult to monitor. The Nord Stream sabotage made this issue visible, but the vulnerability is broader. Offshore wind farms, subsea power cables and hydrogen pipelines may become future targets as the energy system changes.[366]

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[361] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); European Centre of Excellence for Countering Hybrid Threats, *Hybrid Threats: A Comprehensive Resilience Ecosystem* (Helsinki: Hybrid CoE, 2023).

[362] NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

[363] U.S. Energy Information Administration, 'The September 2019 Attacks on Saudi Arabian Oil Facilities Disrupted Global Oil Supplies', EIA, 18 September 2019; World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025).

[364] International Maritime Organization, 'Maritime Security', IMO, accessed 4 June 2026; International Institute for Strategic Studies, *The Military Balance 2026* (London: IISS, 2026).

[365] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); NATO Cooperative Cyber Defence Centre of Excellence, *Cyber Threats and NATO 2030: Horizon Scanning and Analysis* (Tallinn: CCDCOE, 2020).

[366] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

The policy response must include prevention, detection, response and recovery.

Prevention requires risk assessment, physical protection, cyber standards, background checks, maritime surveillance and redundancy.

Detection requires sensors, satellite monitoring, patrols, intelligence-sharing and anomaly detection.

Response requires clear lines of authority, emergency repair capacity, military-civilian co-ordination, public communication and legal frameworks.

Recovery requires spare parts, skilled personnel, alternative routes, insurance arrangements and financial support.[367]

Hybrid threats also require alliance co-ordination. An attack on one state's energy infrastructure can affect neighbours. A pipeline or cable may cross multiple jurisdictions. Private companies may own the asset. NATO, the EU and national authorities must therefore co-ordinate without duplicating roles.[368]

The broader lesson is that fossil fuel systems are vulnerable because they are centralised and high-value. Transition systems will also face hybrid threats, especially grids and offshore infrastructure. However, decentralised generation, storage and demand flexibility can reduce the effect of single-node attacks if designed properly. Security must therefore be built into both existing fossil infrastructure and future low-carbon systems.

6.11 Centralised fossil systems and cascading economic effects

Fossil fuel systems produce cascading economic effects because they are centralised and deeply embedded in the economy. A disruption to one infrastructure node or route can affect energy prices, industrial production, transport, food, inflation, public finance and political stability.[369]

A pipeline cut can raise gas prices. Higher gas prices can raise electricity prices where gas-fired generation sets the marginal price. Higher electricity prices can affect aluminium, fertilisers, chemicals, steel and other energy-intensive industries. Fertiliser disruption can affect agriculture. Higher transport fuel prices can affect food distribution. Household bills

[367] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission, *Proposal for a Directive of the European Parliament and of the Council on the Resilience of Critical Entities*, COM(2020) 829 final, Brussels, 16 December 2020; Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities, *Official Journal of the European Union*, L 333, 27 December 2022, pp. 164–198.

[368] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats*, JOIN(2023) 8 final, Brussels, 10 March 2023.

[369] European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022; International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

can drive public anger. Governments may respond with subsidies, increasing fiscal pressure. A single energy shock can therefore spread through the whole economy.[370]

Oil shocks operate similarly. Higher crude prices raise petrol, diesel, jet fuel and shipping costs. Transport costs affect almost every sector. Food prices can rise because agriculture depends on diesel, fertiliser and logistics. Militaries face higher fuel costs. Airlines, shipping companies and hauliers may pass costs to consumers. Inflation can force central banks to tighten policy, affecting growth.[371]

Gas shocks are particularly important for Europe because gas is used in heating, electricity generation and industry. The 2022 crisis showed how gas dependence could become a macroeconomic issue. Governments had to spend large sums to protect households and companies. Industrial production was affected. Inflation rose. Energy policy became central to fiscal and monetary policy.[372]

Cascading effects also occur through expectation. If markets expect future shortages, prices rise. If companies expect high prices, they may reduce production or relocate. If households expect unaffordable bills, political pressure increases. Energy insecurity therefore affects behaviour before physical shortages occur.

Centralised fossil systems are vulnerable because many flows pass through a limited number of nodes. A refinery outage can affect fuel availability. An LNG terminal problem can affect gas supply. A port strike can delay imports. A pipeline explosion can interrupt regional supply. A chokepoint threat can affect global prices. The concentration that makes fossil systems efficient also makes them fragile.[373]

Decentralised renewable systems can reduce some cascading risks, but only if designed with resilience. Distributed generation, storage, interconnectors, demand response and microgrids can reduce dependence on single fuel flows. However, electricity systems can also cascade if grids are weak, cyberattacks succeed or storage is inadequate. The lesson is not that renewables are automatically resilient. It is that fossil fuel systems have specific cascading vulnerabilities linked to fuel flows and centralised infrastructure.[374]

For policy, cascading risk requires integrated planning.

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[370] European Commission, Directorate-General for Economic and Financial Affairs, *European Economic Forecast: Spring 2023*, Institutional Paper 200 (Luxembourg: Publications Office of the European Union, 2023); European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

[371] *June 2025* (Paris: IEA, 2025); World Bank, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026).

[372] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; Giovanni Sgaravatti, Simone Tagliapietra, Cecilia Trasi and Georg Zachmann, 'National Fiscal Policy Responses to the Energy Crisis', Bruegel Dataset, accessed 4 June 2026.

[373] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[374] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

Energy ministries must work with finance ministries because energy shocks affect inflation and public spending.

Defence ministries must work with infrastructure operators because energy disruption affects military readiness.

Environmental agencies must be involved because infrastructure attacks can create pollution and public-health risks.

Transport ministries must plan for fuel disruption.

Foreign ministries must understand how supplier politics affects domestic stability.

Regulators must ensure that commercial efficiency does not undermine resilience.[375]

Cascading effects also justify demand reduction. Every unit of energy not required from a vulnerable fossil fuel route reduces systemic exposure. Efficiency, electrification and renewable generation are therefore risk-reduction tools.

The conclusion of this chapter is that fossil fuel dependence is geographically and infrastructurally fragile. Chokepoints, pipelines, LNG terminals, refineries, ports, storage sites and undersea assets concentrate risk. They can be threatened by states, armed groups, accidents, sabotage, drones, mines and cyberattacks. A resilient security strategy must protect existing infrastructure during transition, reduce fossil demand, diversify routes and build energy systems that are less vulnerable to single points of failure.

Chapter 7

Environmental Damage as a Conflict Multiplier

7.1 Fossil fuels, environmental harm and instability

Fossil fuels create environmental harm in peacetime and in war. Extraction, processing, transport and combustion can damage air, land, water, ecosystems and public health. In conflict, these risks increase. Oil wells may be set alight. Refineries and fuel depots may be bombed. Pipelines may be ruptured. Coal mines may flood. Gas infrastructure may leak methane. Power stations may be attacked. Ports, storage sites and offshore platforms may become military targets.[376]

This chapter examines fossil fuel-related environmental damage as a conflict multiplier. It does not argue that environmental harm mechanically causes war. Armed conflict is usually

[375] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

[376] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

driven by political, institutional, territorial, economic and military factors. However, environmental degradation can worsen instability where governance is weak, livelihoods are fragile and state capacity is limited. It can deepen grievances, increase displacement, reduce economic resilience and complicate post-conflict recovery.[377]

Fossil fuel-related environmental damage matters for security for five reasons:

1. It can undermine livelihoods. Oil spills, contaminated farmland, polluted rivers and damaged fisheries can reduce income and food security. Communities that lose livelihoods may become more vulnerable to mobilisation by armed groups, criminal networks or protest movements.[378]
2. It can weaken public trust. Where communities believe that governments, companies or armed actors have profited from extraction while leaving pollution behind, grievances can accumulate. Environmental injustice can become a political issue.
3. It can increase state burdens. Pollution requires clean-up, medical treatment, compensation, infrastructure repair and long-term monitoring. A weak state may lack capacity to respond. Failure to respond can further reduce legitimacy.
4. Environmental damage can interact with war economies. Oil theft, illegal refining, fuel smuggling and sabotage may generate income for armed or criminal groups while worsening pollution.[379]
5. Attacks on energy infrastructure can produce cascading civilian effects. Damage to power stations or fuel depots can disrupt water supply, hospitals, heating, communications, food storage and transport.[380]

The link between fossil fuels and environmental security is therefore not marginal. It is embedded in the way fossil energy systems operate. Extraction sites, pipelines, refineries, ports, storage tanks and power stations are geographically fixed and environmentally hazardous. When conflict reaches them, the consequences can outlast the fighting.

Several historical and contemporary cases demonstrate these dynamics. Kuwait's burning oil wells in 1991 showed how deliberate destruction of fossil fuel infrastructure can create large-scale environmental damage. The Niger Delta illustrates how long-term extraction, pollution, weak governance and illicit activity can contribute to insecurity. Iraq's oil fires and refinery damage show the repeated environmental risks of war in oil-producing regions. Ukraine demonstrates the environmental consequences of attacks on energy infrastructure

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[377] Stockholm International Peace Research Institute, Environment of Peace: Security in a New Era of Risk (Stockholm: SIPRI, 2022); Intergovernmental Panel on Climate Change, Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2022).

[378] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); Michael Watts, 'Petro-Violence: Community, Extraction, and Political Ecology of a Mythic Commodity', in Nancy Lee Peluso and Michael Watts, eds., *Violent Environments* (Ithaca, NY: Cornell University Press, 2001).

[379] Cyril Obi and Siri Aas Rustad, eds., Oil and Insurgency in the Niger Delta: Managing the Complex Politics of Petro-Violence (London: Zed Books, 2011); Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005).

[380] World Bank, Government of Ukraine, European Union and United Nations, Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024 (Washington, DC: World Bank, 2025); United Nations Human Rights Monitoring Mission in Ukraine, Report on the Human Rights Situation in Ukraine, 1 December 2023 to 29 February 2024 (Geneva: Office of the United Nations High Commissioner for Human Rights, 2024).

in a modern industrial war. Syria's drought and governance debate shows why analysts must be careful: climate and environmental stress can contribute to instability, but they should not be treated as simple causes of war.[381]

The central claim of this chapter is therefore bounded but important. Fossil fuel-related environmental damage can multiply insecurity when it interacts with weak governance, armed competition, economic dependence, displacement, poverty or wartime targeting. Reducing fossil fuel dependence, improving environmental accountability and protecting energy infrastructure are therefore part of conflict-prevention and post-conflict recovery policy.

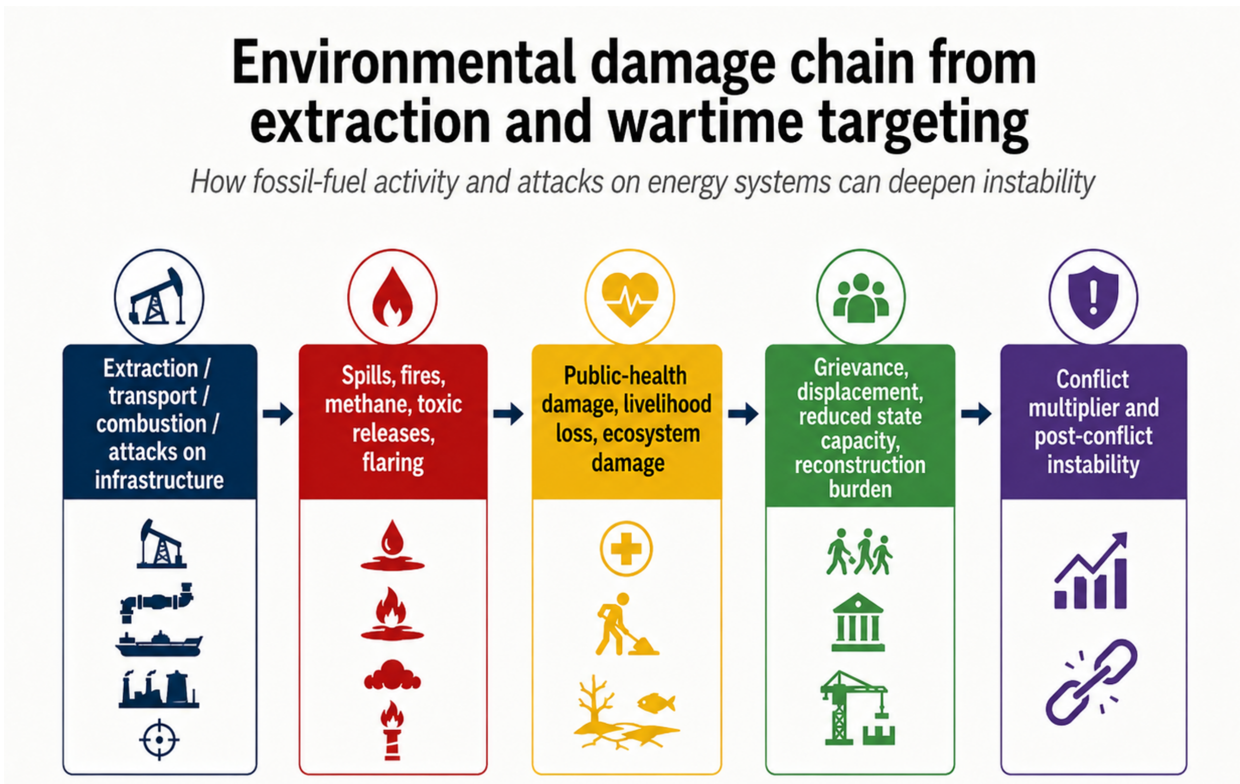

Figure 10. Environmental damage chain from extraction and wartime targeting. Fossil fuel-related environmental damage can undermine livelihoods, public health and state capacity, making it a conflict multiplier in fragile or war-affected settings.

[381] United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011); Jan Selby, Omar S. Dahi, Christiane Fröhlich and Mike Hulme, 'Climate Change and the Syrian Civil War Revisited', Political Geography, vol. 60, 2017, pp. 232–244.

7.2 Oil spills and long-term contamination

Oil spills are among the most visible forms of fossil fuel-related environmental damage. They can occur through accidents, poor maintenance, sabotage, theft, pipeline rupture, tanker incidents, offshore blowouts or deliberate wartime action. Their effects can persist for years, particularly where clean-up is delayed, governance is weak or affected communities depend directly on land, rivers, mangroves, fisheries or coastal ecosystems.[382]

The security significance of oil spills lies not only in ecological damage. It also lies in the social and political consequences. Where oil pollution destroys livelihoods, contaminates drinking water or damages agricultural land, it can generate grievances against the state, companies, local elites or armed actors. These grievances may be exploited by militant groups, criminal networks or political movements. In fragile states, environmental damage can become part of a wider pattern of distrust and violence.[383]

Oil contamination can affect security through several pathways.

The first is livelihood loss. Fishing, farming, grazing and small-scale trade may be affected by polluted water or soil. Where alternative employment is limited, affected populations may turn to illicit economies or armed groups.

The second is public-health harm. Exposure to hydrocarbons and associated toxins can affect respiratory health, skin conditions, water safety and long-term disease risk. Health burdens can increase resentment and reduce state legitimacy.

The third is compensation conflict. Disputes over responsibility, clean-up, compensation and benefit-sharing can become politically charged. Communities may accuse companies or governments of neglect. Companies may accuse local actors of sabotage or theft.

The fourth is criminalisation of extraction zones. Oil theft and illegal refining can both cause and follow environmental damage. Where formal governance is weak, pollution and illicit profit can reinforce each other.

The fifth is militarisation. Governments or companies may deploy security forces to protect pipelines and facilities. If local communities view those forces as protecting polluters rather than citizens, conflict risk increases.[384]

The Niger Delta is the most significant long-term example. Decades of oil extraction, spills, gas flaring, sabotage, theft and weak regulatory enforcement have produced severe environmental and social consequences. UNEP's assessment of Ogoniland found extensive

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[382] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); International Tanker Owners Pollution Federation, *Oil Tanker Spill Statistics 2024* (London: ITOPF, 2025).

[383] Human Rights Watch, The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Oil Producing Communities (New York: Human Rights Watch, 1999); Amnesty International, Nigeria: Petroleum, Pollution and Poverty in the Niger Delta (London: Amnesty International, 2009).

[384] Cyril Obi and Siri Aas Rustad, eds., Oil and Insurgency in the Niger Delta: Managing the Complex Politics of Petro-Violence (London: Zed Books, 2011); Michael Watts, 'Petro-Violence: Community, Extraction, and Political Ecology of a Mythic Commodity', in Nancy Lee Peluso and Michael Watts, eds., Violent Environments (Ithaca, NY: Cornell University Press, 2001).

oil contamination, including severe pollution of soil and groundwater in some areas. The case illustrates how environmental damage can become tied to militancy, illicit refining, oil theft and political grievance.[385]

Oil spills in wartime can be even more damaging. When infrastructure is deliberately destroyed or left unrepaired because of insecurity, contamination spreads. Conflict can prevent access by engineers, environmental monitors and clean-up teams. Insurance, legal claims and responsibility may become disputed. Environmental damage then becomes part of the post-conflict burden.[386]

The policy implication is that oil spills should not be treated only as environmental accidents. In fragile or conflict-affected regions, they are security events. Governments and international organisations should include spill response, compensation, environmental monitoring and community engagement in conflict-prevention frameworks. Where pollution is ignored, it may contribute to future instability.

7.3 Gas flaring, methane leakage and local insecurity

Gas flaring and methane leakage are less visible than oil spills but carry major environmental, health and security implications. Flaring occurs when associated gas from oil production is burned rather than captured or used. Methane leakage occurs across gas production, processing, transport and distribution systems. Both contribute to climate change, local pollution and waste of valuable energy.[387]

In peacetime, gas flaring is often a sign of weak regulation, poor infrastructure or commercial incentives that favour oil production over gas capture. In conflict zones, flaring and leakage may increase because infrastructure is damaged, monitoring collapses, operators leave, or armed actors take control of facilities.

Gas flaring can affect local communities through air pollution, heat, noise and damage to agriculture. It may contribute to respiratory illness and degrade local environments. Where communities receive little benefit from extraction but bear the pollution, grievances can deepen.[388]

Methane leakage has broader climate implications. Methane is a powerful greenhouse gas. Leaks from pipelines, compressor stations, wells and processing sites contribute to global warming. In conflict, methane releases may occur through sabotage, poor maintenance or

[385] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); United Nations Environment Programme, 'UNEP Ogoniland Oil Assessment Reveals Extent of Environmental Contamination and Threats to Human Health', UNEP, 4 August 2011.

[386] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

[387] International Energy Agency, Global Methane Tracker 2025 (Paris: IEA, 2025); World Bank, Global Gas Flaring Tracker Report 2025 (Washington, DC: World Bank, 2025).

[388] United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011); World Bank, Global Gas Flaring Tracker Report 2025 (Washington, DC: World Bank, 2025).

deliberate destruction. The Nord Stream explosions in September 2022 were a major example of methane release from damaged undersea gas infrastructure.[389]

Gas flaring and methane leakage can contribute to insecurity through four mechanisms:

1. They signal weak governance. Persistent flaring often reflects poor regulation, weak enforcement or political capture of the energy sector. Communities may interpret it as evidence that government and companies value extraction over public welfare.
2. They waste energy. Gas that could provide electricity, heating or industrial input is burned or lost. In energy-poor regions, this can deepen resentment.
3. They contribute to climate stress. Methane emissions and flaring add to global climate change, which can affect water, food and displacement pressures.
4. Damaged gas infrastructure creates safety risks. Explosions, fires and toxic exposure can affect civilians and emergency responders.[390]

In oil-producing regions such as the Niger Delta and parts of Iraq, flaring has long been associated with weak environmental governance. In wartime settings, the risk increases because maintenance and monitoring become secondary to military priorities. Damaged gas infrastructure may continue leaking without repair.[391]

For Europe and NATO, methane leakage and gas infrastructure damage carry additional implications. As Europe increased LNG imports and diversified gas supplies after 2022, methane intensity across supply chains became more relevant. A gas security policy that ignores methane leakage may reduce one security vulnerability while worsening environmental harm.[392]

The policy response should include methane monitoring, satellite detection, mandatory leak repair, flaring reduction, environmental reporting and accountability for damage during conflict. International standards should apply not only to domestic production but also to imported gas supply chains. If gas is used as a transitional fuel, its environmental and security risks must be assessed honestly.

7.4 Coal pollution and public health pressure

Coal remains central to the global energy system, particularly in electricity generation, steel production and some industrial processes. Although this White Paper focuses heavily on oil and gas because of their geopolitical and coercive roles, coal also carries security

[389] United Nations Environment Programme, 'UNEP Finds Nord Stream Gas Leak May Be the Highest Methane Emission Event, but Still a Drop in the Ocean', UNEP, 20 February 2023; International Energy Agency, *Global Methane Tracker 2025* (Paris: IEA, 2025).

[390] International Energy Agency, *Global Methane Tracker 2025* (Paris: IEA, 2025); Regulation (EU) 2024/1787 of the European Parliament and of the Council of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, *Official Journal of the European Union*, L, 2024/1787, 15 July 2024.

[391] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); U.S. Energy Information Administration, *Country Analysis Brief: Iraq* (Washington, DC: EIA, 2024).

[392] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Gas Market Report, Q1 2023* (Paris: IEA, 2023).

implications. Its environmental and public-health effects can weaken societies, increase economic burdens and create political pressure.[393]

Coal pollution affects air, land and water. Coal combustion releases particulate matter, sulphur dioxide, nitrogen oxides, mercury and carbon dioxide. Coal mining can damage landscapes, pollute water, create subsidence and expose workers to health risks. Coal ash disposal can contaminate soil and water. In areas with weak regulation, these effects may be severe.[394]

The security relevance of coal pollution lies in public health and economic resilience. High pollution levels increase healthcare costs, reduce labour productivity and contribute to public discontent. In fragile states, these pressures can interact with weak governance and social inequality. Where coal mining regions are economically dependent on a declining industry, transition can also create political instability if not managed.[395]

Coal differs from oil and gas in several ways. It is more widely distributed, easier to store and often traded through more flexible supply chains. It is therefore less commonly used as an instrument of geopolitical coercion than pipeline gas or oil chokepoints. However, coal can still create strategic dependence where electricity systems or heavy industries rely heavily on imported coal, coking coal or specialised grades.[396]

Coal can also create internal political dependence. Regions economically dependent on coal mining may resist transition unless alternative employment, infrastructure and investment are provided. If governments accelerate coal phase-out without credible social and industrial policy, affected communities may experience economic decline and political alienation. This can be exploited by populist or hostile actors.[397]

In wartime, coal infrastructure can become a target. Mines, rail lines, coal-fired power plants and electricity networks may be attacked. Coal stockpiles may become strategic assets during winter or energy shortages. In Ukraine, attacks on electricity infrastructure and power plants have shown how fossil and non-fossil energy systems alike become central to civilian resilience during war.[398]

Coal pollution also has climate implications. Continued coal combustion is a major contributor to greenhouse gas emissions. Climate change then interacts with conflict risks

[393] International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024); World Health Organization, ‘Ambient (Outdoor) Air Pollution’, WHO, 24 October 2024.

[394] World Health Organization, ‘Ambient (Outdoor) Air Pollution’, WHO, 24 October 2024; International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024).

[395] World Health Organization, ‘Ambient (Outdoor) Air Pollution’, WHO, 24 October 2024; World Bank, *Managing Coal Mine Closure: Achieving a Just Transition for All* (Washington, DC: World Bank, 2018).

[396] International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024); International Energy Agency, ‘Energy Security’, IEA, accessed 4 June 2026.

[397] World Bank, *Managing Coal Mine Closure: Achieving a Just Transition for All* (Washington, DC: World Bank, 2018); European Commission, ‘The Just Transition Mechanism: Making Sure No One Is Left Behind’, European Commission, accessed 4 June 2026.

[398] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025); International Energy Agency, ‘Ukraine’s Energy Security and the Coming Winter’, IEA, September 2024.

through water stress, food insecurity, displacement and disaster-response burdens. Again, the relationship is not deterministic. Coal does not mechanically cause war. But coal dependence can contribute to environmental pressures that weaken resilience.[399]

The policy implication is that coal transition should be treated as both environmental and security policy. A planned transition reduces pollution, emissions and import dependence. An unmanaged transition can create regional economic stress. A delayed transition prolongs public-health harm and emissions. Effective policy requires investment in affected regions, retraining, industrial diversification, grid reliability and social dialogue.[400]

Coal's role in this White Paper is therefore twofold. It is part of the fossil fuel system that drives environmental harm and climate stress. It is also a reminder that energy transition must be socially and economically managed if it is to strengthen security rather than create new instability.

7.5 Scorched-earth tactics and wartime environmental destruction

Scorched-earth tactics involve deliberate destruction of resources, infrastructure or territory to deny their use to an adversary. In fossil fuel systems, such tactics can produce severe environmental damage. Oil wells may be set alight, refineries destroyed, pipelines ruptured, storage tanks burned, mines flooded or power plants sabotaged. The purpose may be military denial, punishment, retreat strategy, economic coercion or political signalling.[401]

Fossil fuel infrastructure is particularly vulnerable to scorched-earth tactics because it is hazardous by nature. Oil, gas and coal assets contain flammable, toxic and environmentally damaging materials. Destruction can release pollutants into air, soil, rivers and seas. Fires can burn for long periods. Clean-up may require specialised equipment and access that conflict conditions prevent.[402]

The 1991 destruction of Kuwaiti oil wells by retreating Iraqi forces is the most prominent example. Hundreds of wells were set on fire, producing vast smoke plumes, oil lakes, air pollution and contamination. The act was intended to damage Kuwait's economic capacity and complicate coalition operations. Its environmental consequences became a landmark case in wartime ecological destruction.[403]

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[399] Intergovernmental Panel on Climate Change, Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Geneva: IPCC, 2023); Stockholm International Peace Research Institute, Environment of Peace: Security in a New Era of Risk (Stockholm: SIPRI, 2022).

[400] World Bank, Managing Coal Mine Closure: Achieving a Just Transition for All (Washington, DC: World Bank, 2018); European Commission, 'The Just Transition Mechanism: Making Sure No One Is Left Behind', European Commission, accessed 4 June 2026.

[401] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

[402] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Law Commission, Draft Principles on Protection of the Environment in Relation to Armed Conflicts, with Commentaries, in Report of the International Law Commission on the Work of Its Seventy-Third Session, UN Doc. A/77/10, 2022.

[403] United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations

Scorched-earth tactics may also occur at smaller scale. Armed groups may set fire to oil depots, sabotage pipelines, burn fuel stocks or destroy power plants. Retreating forces may mine refineries or damage electricity networks. Criminal groups may destroy infrastructure to hide theft or punish rivals. In each case, environmental and civilian consequences can outlast military utility.[404]

Such tactics affect security in several ways:

1. They increase reconstruction costs. Restoring oilfields, refineries, pipelines and power systems is expensive and technically demanding.
2. They delay economic recovery. A state dependent on energy exports or electricity infrastructure may struggle to restore revenue and services.
3. They harm civilians. Pollution, fuel shortages, power outages and water disruption affect daily life.
4. They complicate accountability. Responsibility may be disputed, evidence may be destroyed, and legal claims may take years.
5. They create transboundary effects. Smoke, spills, river pollution and marine contamination can cross borders.[405]

The environmental consequences of scorched-earth tactics should be integrated into international legal and policy frameworks. Environmental damage in war is not incidental when infrastructure is deliberately targeted for its ecological and economic effect. Documentation, satellite monitoring, forensic sampling and claims mechanisms are necessary.[406]

For energy policy, scorched-earth risk reinforces the danger of centralised hazardous infrastructure in conflict zones. A single refinery or oil terminal can become both an economic lifeline and an environmental weapon. Resilience planning should therefore include emergency shutdown systems, fire suppression, containment, decentralised backup energy and post-conflict environmental response.

7.6 Kuwait's burning oil wells in 1991

The burning of Kuwait's oil wells in 1991 remains one of the most significant examples of fossil fuel infrastructure used for wartime destruction. As Iraqi forces retreated from Kuwait

Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009).

[404] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015).

[405] United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims*, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims*, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; International Committee of the Red Cross, *Guidelines on the Protection of the Natural Environment in Armed Conflict* (Geneva: ICRC, 2020).

[406] International Law Commission, Draft Principles on Protection of the Environment in Relation to Armed Conflicts, with Commentaries, in Report of the International Law Commission on the Work of Its Seventy-Third Session, UN Doc. A/77/10, 2022; International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

during the Gulf War, they set fire to hundreds of oil wells. The resulting fires burned for months, creating enormous smoke plumes, oil lakes, air pollution and widespread environmental damage.[407]

The event demonstrates several elements of fossil fuel-related environmental insecurity:

1. It shows how oil infrastructure can be turned into a weapon during retreat. The destruction was not an accidental by-product of battle. It was deliberate. The objective was to damage Kuwait's economic base, obstruct coalition forces and leave behind a costly environmental crisis.[408]
2. It shows the scale of damage possible when fossil infrastructure is attacked. Oil wells, pipelines and storage facilities contain large volumes of flammable hydrocarbons. Once ignited, fires may be difficult to extinguish. Specialised crews, equipment and months of effort may be needed.
3. It shows how environmental harm can become part of post-war recovery. Kuwait's reconstruction required not only rebuilding infrastructure but also dealing with contaminated soil, oil lakes, air pollution and ecological damage.[409]
4. It shows the transboundary nature of fossil fuel pollution. Smoke and pollutants can travel across borders. Marine pollution can affect neighbouring waters. Environmental security is therefore not confined within state boundaries.
5. The case contributed to the development of environmental claims and compensation mechanisms. The United Nations Compensation Commission addressed claims arising from Iraq's invasion and occupation of Kuwait, including environmental damage.[410]

The Kuwait case remains relevant because modern energy infrastructure is still vulnerable to similar tactics. Oilfields in Iraq and Syria have been set alight by armed groups. Refineries and depots have been attacked in various conflicts. Russia's war against Ukraine has

[407] United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009).

[408] Lawrence Freedman and Efraim Karsh, *The Gulf Conflict 1990–1991: Diplomacy and War in the New World Order* (Princeton, NJ: Princeton University Press, 1993); United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims*, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims*, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005.

[409] United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims*, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009).

[410] United Nations Security Council Resolution 692, UN Doc. S/RES/692, 20 May 1991; United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims*, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, *Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims*, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005.

included repeated attacks on energy infrastructure. The technology of war has changed, but the vulnerability of fossil fuel assets remains.[411]

Kuwait also illustrates why environmental harm should be considered in military planning. Attacks on fossil infrastructure may have immediate military value but long-term ecological costs. The law of armed conflict includes principles of proportionality and necessity, but environmental considerations have often been secondary in practice. The scale of the Kuwaiti fires helped change awareness of wartime environmental damage.[412]

For this White Paper, the case is a warning. Fossil fuel infrastructure creates concentrated environmental risk. When war reaches that infrastructure, the damage can be deliberate, extensive and long-lasting. A security strategy that protects civilians and supports recovery must include environmental protection, rapid response and accountability.

7.7 Iraq's oil fires and legacy contamination

Iraq has experienced repeated episodes of oil-related environmental damage across decades of war, sanctions, insurgency and state fragility. The country's oil infrastructure has been targeted, sabotaged, burned, looted and degraded in different conflicts. These episodes have contributed to air pollution, soil contamination, water risks and public-health concerns.[413]

The 1991 Gulf War caused major environmental damage linked to oil infrastructure in Kuwait and the wider region. Later conflicts in Iraq added further layers. During the 2003 invasion and subsequent insurgency, pipelines, refineries and fuel infrastructure were repeatedly attacked. Oil smuggling, sabotage and illegal tapping became part of the conflict economy. In the campaign against ISIS, oil wells and facilities were again damaged or set on fire.[414]

Iraq's case shows the cumulative nature of fossil fuel-related environmental harm. Each conflict leaves contamination, damaged infrastructure and weakened regulatory capacity. When state institutions are already under pressure, environmental monitoring and clean-up may be delayed. Communities may live near polluted sites for years.[415]

The security implications are significant:

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[411] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2024* (Washington, DC: World Bank, 2025); Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015).

[412] International Committee of the Red Cross, *Guidelines on the Protection of the Natural Environment in Armed Conflict* (Geneva: ICRC, 2020); Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, adopted 8 June 1977, entered into force 7 December 1978, 1125 UNTS 3.

[413] U.S. Energy Information Administration, *Country Analysis Brief: Iraq* (Washington, DC: EIA, 2024); United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009).

[414] Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015).

[415] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); World Bank, Iraq Economic Monitor: Navigating the Perfect Storm (Washington, DC: World Bank, 2024).

1. Oil infrastructure becomes a recurring target because it is central to state revenue. Attacking pipelines or refineries damages the state's fiscal base and creates political pressure.
2. Illicit oil economies can flourish in weak governance conditions. Smuggling, theft and illegal refining provide income to armed groups, criminal networks and corrupt officials.
3. Environmental damage can worsen public distrust. Citizens who see oil wealth exported while local environments are polluted may lose faith in the state.
4. Contamination can affect agriculture, water and health, increasing local grievances.
5. Reconstruction becomes more expensive. A state emerging from conflict must repair infrastructure and address pollution simultaneously.[416]

The ISIS period demonstrated the deliberate use of oil fires. As the group retreated, it set wells alight in some areas, producing smoke and pollution. The fires also had military purposes: obscuring visibility, slowing operations and denying resources. This repeated the logic of scorched-earth tactics seen in Kuwait, though on a different scale.[417]

Iraq also illustrates the difficulty of separating environmental, economic and security policy. Oil revenue is essential to the state budget. Reducing environmental harm requires regulation, investment and governance capacity. Protecting infrastructure requires security forces. Preventing smuggling requires law enforcement and local economic alternatives. Each element depends on the others.

For international partners, the lesson is that post-conflict assistance should integrate environmental remediation into state-building. Repairing pipelines without addressing pollution and corruption may restore revenue but not legitimacy. Environmental recovery should be treated as part of stabilisation.

7.8 The Niger Delta: extraction, pollution, militancy and governance failure

The Niger Delta is one of the most important cases of long-term fossil fuel extraction, environmental degradation and insecurity. Nigeria is a major oil producer, and the Niger Delta has generated substantial national revenue. Yet many local communities have experienced pollution, underdevelopment, weak governance and insecurity.[418]

The region's problems are not caused by oil alone. They reflect a complex history of federal politics, ethnic claims, corruption, poverty, weak regulation, criminal networks, company

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[416] World Bank, Natural Resources and Violent Conflict: Options and Actions (Washington, DC: World Bank, 2003); Philippe Le Billon, Fuelling War: Natural Resources and Armed Conflicts (London: Routledge, 2005).

[417] Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015).

[418] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); Michael Watts, 'Petro-Violence: Community, Extraction, and Political Ecology of a Mythic Commodity', in Nancy Lee Peluso and Michael Watts, eds., *Violent Environments* (Ithaca, NY: Cornell University Press, 2001).

practices, security-force behaviour and local grievances. However, oil has been central to the political economy of the conflict.[419]

The core grievance in the Niger Delta concerns the distribution of costs and benefits. Oil extraction has generated national and corporate revenue, but affected communities have often borne the environmental costs. Spills, gas flaring, polluted rivers, damaged farmland and degraded fisheries have undermined livelihoods. Where compensation and clean-up have been inadequate or delayed, resentment has grown.[420]

UNEP's assessment of Ogoniland found severe and widespread oil contamination, including pollution of soil and groundwater. The report stated that environmental restoration would require a long-term effort. Ogoniland became a symbol of the wider Niger Delta problem: resource wealth without local environmental security.[421]

Militancy in the Niger Delta emerged from a mixture of political grievance, local mobilisation, criminal opportunity and competition over oil rents. Armed groups attacked pipelines, kidnapped oil workers, stole crude, operated illegal refineries and demanded greater local control over resources. Some groups framed their actions as resistance to exploitation and pollution; others became deeply involved in criminal economies.[422]

Oil theft and illegal refining created a feedback loop. Theft damaged pipelines and caused spills. Illegal refining polluted waterways and mangroves. Armed protection networks developed around illicit activity. State security responses sometimes worsened local tensions. Environmental damage and insecurity reinforced each other.[423]

The Niger Delta demonstrates several lessons:

1. Environmental damage can become a political grievance where communities see extraction wealth leaving the region.
2. Weak governance can turn resource areas into conflict economies.
3. Pollution and illicit activity can become mutually reinforcing.
4. Security responses that do not address environmental and economic grievances may fail.

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[419] Cyril Obi and Siri Aas Rustad, eds., Oil and Insurgency in the Niger Delta: Managing the Complex Politics of Petro-Violence (London: Zed Books, 2011); Human Rights Watch, The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Oil Producing Communities (New York: Human Rights Watch, 1999).

[420] Amnesty International, Nigeria: Petroleum, Pollution and Poverty in the Niger Delta (London: Amnesty International, 2009); United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011).

[421] United Nations Environment Programme, Environmental Assessment of Ogoniland (Nairobi: UNEP, 2011); United Nations Environment Programme, 'UNEP Ogoniland Oil Assessment Reveals Extent of Environmental Contamination and Threats to Human Health', UNEP, 4 August 2011.

[422] Cyril Obi and Siri Aas Rustad, eds., Oil and Insurgency in the Niger Delta: Managing the Complex Politics of Petro-Violence (London: Zed Books, 2011); International Crisis Group, The Swamps of Insurgency: Nigeria's Delta Unrest, Africa Report No. 115 (Brussels: International Crisis Group, 3 August 2006).

[423] Cyril Obi and Siri Aas Rustad, eds., *Oil and Insurgency in the Niger Delta: Managing the Complex Politics of Petro-Violence* (London: Zed Books, 2011); Michael Watts, 'Petro-Violence: Community, Extraction, and Political Ecology of a Mythic Commodity', in Nancy Lee Peluso and Michael Watts, eds., *Violent Environments* (Ithaca, NY: Cornell University Press, 2001).

5. Clean-up is not only an environmental obligation; it is part of restoring legitimacy.[424]

The case is relevant to this White Paper because it shows how fossil fuel extraction can create long-term instability without a conventional interstate war. The security issue is local but strategically significant. Oil theft affects national revenue. Attacks on infrastructure affect production and exports. Pollution affects public health and livelihoods. Militancy affects investment and state authority.

For policy, the Niger Delta supports a comprehensive approach: strict environmental regulation, transparent revenue-sharing, community participation, clean-up, alternative livelihoods, anti-corruption enforcement, demilitarisation where possible, and action against oil theft networks. Fossil fuel security cannot be separated from environmental justice and governance.

7.9 Ukraine: attacks on energy infrastructure and environmental damage

Russia's war against Ukraine has made energy infrastructure a central target. Attacks on power plants, substations, transmission networks, fuel depots, gas infrastructure, refineries and heating systems have had military, economic, humanitarian and environmental consequences. The war demonstrates how modern industrial energy systems can be used as pressure points against civilian resilience.[425]

The targeting of Ukraine's energy infrastructure has several objectives. It can weaken the economy, disrupt military logistics, reduce industrial capacity, create hardship for civilians, pressure the government and increase reconstruction costs. During winter, attacks on electricity and heating systems can have direct humanitarian effects.[426]

Environmental damage arises through several channels:

1. Strikes on fuel depots, refineries and storage tanks can release toxic smoke, hydrocarbons and contaminated runoff.
2. Damage to power infrastructure can disrupt water treatment, sewage systems, hospitals, food storage and heating.
3. Attacks on industrial sites can release hazardous materials beyond the energy sector.
4. Damage to gas infrastructure can cause leaks, fires and methane emissions.
5. Destruction of renewable and conventional power assets increases reconstruction needs and may force reliance on emergency diesel generators.

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[424] United Nations Environment Programme, *Environmental Assessment of Ogoniland* (Nairobi: UNEP, 2011); Extractive Industries Transparency Initiative, *EITI Standard 2023* (Oslo: EITI International Secretariat, 2023).

[425] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026); International Energy Agency, 'Ukraine's Energy Security and the Coming Winter', IEA, September 2024.

[426] United Nations Human Rights Monitoring Mission in Ukraine, *Report on the Human Rights Situation in Ukraine, 1 December 2024 to 31 May 2025* (Geneva: Office of the United Nations High Commissioner for Human Rights, 2025); World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026).

6. Military operations can contaminate land around energy facilities through unexploded ordnance, debris and chemical residues.[427]

The Ukrainian case is important because it combines several themes of this White Paper. Russia's fossil fuel revenue has contributed to state capacity during the war. Europe's dependence on Russian fossil fuels constrained policy before 2022. Russia used gas supplies as leverage. Ukraine's own energy infrastructure became a target. Environmental damage became part of the cost of war. The case therefore links fossil fuel dependence, coercion, conflict finance, infrastructure vulnerability and environmental harm.[428]

Ukraine also demonstrates the value of decentralised and resilient energy systems. Centralised power plants and substations are vulnerable to missile and drone attacks. Distributed generation, microgrids, local storage, protected substations and rapid repair capacity can improve resilience. This does not mean that decentralised systems are immune to attack, but they can reduce dependence on single points of failure.[429]

The reconstruction of Ukraine will therefore have security implications. Rebuilding the pre-war energy system exactly as it was would reproduce some vulnerabilities. A more resilient reconstruction would combine grid hardening, decentralised renewables, storage, interconnectors, energy efficiency, protected critical nodes and emergency backup systems. It would also include environmental remediation at damaged fossil fuel and industrial sites.[430]

The environmental dimension should be included in accountability. Damage to energy infrastructure is not only an economic loss. It can produce pollution, emissions and public-health risks. Documentation should support future claims, reconstruction planning and environmental monitoring.

For Europe and NATO, Ukraine provides a practical lesson. Energy infrastructure is a battlefield in modern war. Civilian resilience depends on energy resilience. A security strategy that ignores power systems, fuel supply and environmental damage is incomplete.

7.10 Climate stress, weak governance and conflict risk

Climate change is often described as a threat multiplier. This term is useful if applied carefully. Climate stress does not automatically cause war. Drought, heat, flooding, crop

[427] United Nations Environment Programme, The Environmental Impact of the Conflict in Ukraine: A Preliminary Review (Nairobi: UNEP, 2022); European Commission, Joint Research Centre, Status of Environment and Climate in Ukraine: Evidence from Remote Sensing and Open Sources (Luxembourg: Publications Office of the European Union, 2024).

[428] Centre for Research on Energy and Clean Air, Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine (Helsinki: CREA, 2022–2026); European Commission, REPowerEU Plan, COM(2022) 230 final, Brussels, 18 May 2022.

[429] International Energy Agency, 'Ukraine's Energy Security and the Coming Winter', IEA, September 2024; Christoph Winkler et al., 'High-Resolution Rooftop-PV Potential Assessment for a Resilient Energy System in Ukraine', 2024.

[430] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026); European Commission, 'Ukraine Recovery and Reconstruction', European Commission, accessed 4 June 2026.

failure or water scarcity become security risks when they interact with weak governance, inequality, corruption, displacement, armed groups, economic shocks or existing conflict.[431]

Fossil fuels contribute to climate change through greenhouse gas emissions. Climate change then affects security environments in several ways:

1. It can increase pressure on water and food systems. Droughts, floods and heatwaves can reduce agricultural output and raise food prices.
2. It can contribute to displacement. People may move because of crop failure, sea-level rise, extreme weather or loss of livelihoods.
3. It can increase competition over resources. Pasture, water, farmland and urban services may become more contested.
4. It can strain state capacity. Governments facing repeated climate shocks may struggle to provide relief, maintain infrastructure and manage public expectations.
5. It can affect military operations. Extreme heat, flooding, wildfires and storms can disrupt bases, logistics and readiness.[432]

However, the relationship between climate and conflict is mediated by politics. Strong institutions can manage environmental stress better than weak ones. Inclusive governance, social safety nets, disaster preparedness, water management and conflict-resolution mechanisms can reduce risk. Conversely, corruption, repression, exclusion and armed mobilisation can turn environmental stress into instability.[433]

Syria is often cited as an example of climate-related conflict because of the severe drought before the civil war. The drought contributed to rural hardship, migration and economic pressure. However, the war cannot be explained by drought alone. Authoritarian governance, repression, political mobilisation, regional dynamics, social grievances and external intervention were central. The Syria case therefore illustrates both the relevance and the limits of climate-security analysis.[434]

A responsible White Paper should avoid deterministic claims. It should not state that climate change causes war in a simple chain. It should state that fossil fuel-driven climate change can increase stress in systems already vulnerable to instability. The policy implication is not that

[431] Stockholm International Peace Research Institute, *Environment of Peace: Security in a New Era of Risk* (Stockholm: SIPRI, 2022); Intergovernmental Panel on Climate Change, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2022).

[432] Intergovernmental Panel on Climate Change, Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2022); NATO, Climate Change and Security Impact Assessment (Brussels: NATO, 2024).

[433] Vally Koubi, 'Climate Change and Conflict', *Annual Review of Political Science*, vol. 22, 2019, pp. 343–360; Katharine J. Mach et al., 'Climate as a Risk Factor for Armed Conflict', *Nature*, vol. 571, 2019, pp. 193–197.

[434] Peter H. Gleick, 'Water, Drought, Climate Change, and Conflict in Syria', *Weather, Climate, and Society*, vol. 6, no. 3, 2014, pp. 331–340; Jan Selby, Omar S. Dahi, Christiane Fröhlich and Mike Hulme, 'Climate Change and the Syrian Civil War Revisited', *Political Geography*, vol. 60, 2017, pp. 232–244.

climate adaptation alone prevents war, but that adaptation, governance and conflict prevention should be linked.[435]

Climate stress also interacts with fossil fuel dependence in producer states. Countries dependent on oil revenue may face fiscal pressure as the world transitions away from fossil fuels, while also facing climate impacts such as heat, water scarcity or coastal risk. This double exposure can be destabilising if not managed.[436]

For importers, climate stress can affect global supply chains, food prices and migration patterns. Energy transition is therefore relevant both to mitigation and security. Reducing fossil fuel use lowers long-term climate risk, while adaptation strengthens resilience to unavoidable impacts.

The climate-security argument should therefore be framed in terms of risk management. Fossil fuels contribute to climate change; climate change increases stress; stress can worsen conflict risk where institutions are weak. This is a serious security concern, but it is not a single-cause explanation for war.

7.11 Avoiding deterministic claims about climate and war

A credible White Paper must avoid overstating the relationship between fossil fuels, climate change and armed conflict. There is a temptation in policy debate to draw a direct line from emissions to climate change, from climate change to resource scarcity, and from scarcity to war. That chain is too simple.[437]

Environmental stress may contribute to instability, but it is rarely sufficient on its own. The same drought may produce adaptation in one country and unrest in another. The difference lies in governance, institutions, wealth, social trust, inequality, political freedom, conflict history and external intervention. Climate stress is therefore best understood as a multiplier of existing vulnerabilities.[438]

Deterministic claims are problematic for several reasons:

1. They can obscure political responsibility. If war is attributed too heavily to climate, the role of repression, corruption, exclusion, elite decisions and foreign intervention may be downplayed.

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[435] Tobias Ide, ‘Climate War in the Middle East? Drought, the Syrian Civil War and the State of Climate-Conflict Research’, *Current Climate Change Reports*, vol. 4, 2018, pp. 347–354; Vally Koubi, ‘Climate Change and Conflict’, *Annual Review of Political Science*, vol. 22, 2019, pp. 343–360.

[436] International Monetary Fund, Economic Diversification in Oil-Exporting Arab Countries (Washington, DC: IMF, 2016); Intergovernmental Panel on Climate Change, Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2022).

[437] Jan Selby, Omar S. Dahi, Christiane Fröhlich and Mike Hulme, ‘Climate Change and the Syrian Civil War Revisited’, *Political Geography*, vol. 60, 2017, pp. 232–244; Tobias Ide, ‘Climate War in the Middle East? Drought, the Syrian Civil War and the State of Climate-Conflict Research’, *Current Climate Change Reports*, vol. 4, 2018, pp. 347–354.

[438] Katharine J. Mach et al., ‘Climate as a Risk Factor for Armed Conflict’, *Nature*, vol. 571, 2019, pp. 193–197; Vally Koubi, ‘Climate Change and Conflict’, *Annual Review of Political Science*, vol. 22, 2019, pp. 343–360.

2. They can encourage fatalism. If climate automatically causes war, policy may appear powerless. In fact, governance, adaptation and conflict prevention can reduce risk.
3. They can stigmatise vulnerable regions. Countries facing climate stress may be portrayed as inevitable sources of conflict or migration, which can distort policy.
4. They can weaken evidence-based advocacy. Overclaiming invites criticism and makes the security case for transition less credible.
5. They can lead to poor policy design. If the diagnosis is wrong, responses may focus narrowly on environmental stress while ignoring institutions, accountability and violence prevention.[439]

The approach adopted in this White Paper is therefore cautious. It makes four claims:

1. Fossil fuel extraction, transport and combustion cause environmental damage and greenhouse gas emissions.
2. Environmental damage and climate stress can worsen instability where governance is weak or conflict is already present.
3. Attacks on fossil fuel and energy infrastructure during war can create environmental harm that complicates recovery.
4. Reducing fossil fuel dependence can reduce some long-term environmental and security risks, but it must be accompanied by adaptation, governance reform and resilience planning.

This approach is analytically stronger than a simple climate-causes-war claim. It also aligns better with policy practice. Governments and international organisations can act on risk factors without pretending that one variable explains every conflict.[440]

The same caution should be applied to claims about renewables. Renewable energy does not guarantee peace. Critical minerals, land use, water needs, grid vulnerability and supply-chain concentration can create tensions. The issue is not whether any energy system is risk-free. The issue is which risks are reduced, which are created, and how policy manages them.[441]

A mature security argument for energy transition should therefore be comparative, evidence-based and institutionally grounded. It should state that fossil fuels have repeatedly contributed to coercion, war finance, infrastructure vulnerability and environmental damage. It should also state that transition must be managed to avoid new dependencies and social instability.

[439] Tobias Ide, 'Climate War in the Middle East? Drought, the Syrian Civil War and the State of Climate-Conflict Research', *Current Climate Change Reports*, vol. 4, 2018, pp. 347–354; Stockholm International Peace Research Institute, *Environment of Peace: Security in a New Era of Risk* (Stockholm: SIPRI, 2022).

[440] Intergovernmental Panel on Climate Change, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2022); Stockholm International Peace Research Institute, *Environment of Peace: Security in a New Era of Risk* (Stockholm: SIPRI, 2022).

[441] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

7.12 Environmental security as part of post-conflict recovery

Post-conflict recovery often focuses on ceasefires, political settlement, reconstruction, humanitarian assistance, security-sector reform and economic stabilisation. Environmental damage is sometimes treated as secondary. That approach is inadequate where fossil fuel infrastructure has been damaged or extraction-related pollution has contributed to conflict.[442]

Environmental security should be integrated into post-conflict recovery for several reasons:

1. Pollution affects health. Communities returning after conflict may face contaminated water, soil, air and food sources. Failure to address this can undermine recovery.
2. Environmental damage affects livelihoods. Farmers, fishers, herders and small businesses may be unable to resume work if land and water are polluted.
3. Clean-up can support legitimacy. A government or international mission that addresses environmental harm may build trust with affected communities.
4. Unresolved pollution can fuel renewed grievance. If communities believe that their suffering is ignored, conflict narratives may persist.
5. Environmental evidence may support accountability. Documentation of oil spills, refinery damage, methane releases and scorched-earth tactics can be relevant to compensation and legal claims.
6. Reconstruction choices affect future resilience. Rebuilding the same vulnerable fossil infrastructure may restore immediate services but reproduce long-term risks.[443]

A post-conflict environmental-security framework should include several components.

The first is rapid assessment. Satellite imagery, field sampling, drone surveys and local reporting should identify damaged oil wells, refineries, pipelines, depots, mines and power stations.

The second is hazard containment. Fires, leaks, spills and toxic releases should be stabilised quickly where security conditions allow.

The third is public-health monitoring. Communities near damaged infrastructure should be screened for exposure risks.

The fourth is livelihood restoration. Farmers, fishers and workers affected by fossil fuel pollution should be included in compensation and recovery plans.

The fifth is legal documentation. Evidence should be preserved for claims, reparations or prosecutions where relevant.

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[442] United Nations Environment Programme, From Conflict to Peacebuilding: The Role of Natural Resources and the Environment (Nairobi: UNEP, 2009); Carl Bruch, Carroll Muffett and Sandra S. Nichols, eds., Governance, Natural Resources, and Post-Conflict Peacebuilding (London: Earthscan/Routledge, 2016).

[443] United Nations Environment Programme, From Conflict to Peacebuilding: The Role of Natural Resources and the Environment (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

The sixth is transparent contracting. Clean-up and reconstruction funds are vulnerable to corruption. Oversight is essential.

The seventh is resilient reconstruction. Energy systems should be rebuilt with lower vulnerability, greater efficiency, decentralised capacity and cleaner technology where possible.[444]

Ukraine is likely to become a major test case for this approach. Reconstruction will require repair of power systems, heating infrastructure, fuel depots, industrial sites and grids. Environmental assessment should be integrated from the start. The same applies to Iraq, Libya, Syria, Sudan and other conflict-affected fossil fuel regions.[445]

Environmental security also matters for international financial institutions. Reconstruction loans and grants should include environmental risk assessment, pollution remediation and resilience standards. Clean-up should not be postponed indefinitely because it is costly. Delayed remediation often becomes more expensive and politically damaging over time.

The conclusion of this chapter is that fossil fuel-related environmental damage is a security issue. It can destroy livelihoods, weaken state legitimacy, finance illicit actors, damage public health and complicate recovery. It does not mechanically cause war, but it can multiply instability in already fragile systems. A serious strategy for reducing fossil fuel dependence should therefore include environmental accountability, infrastructure protection and post-conflict remediation as core security measures.

Chapter 8

Europe's Exposure and Strategic Response

8.1 Europe's structural dependence on imported fossil fuels

Europe's energy-security problem is structural. The European Union has made substantial progress in reducing its dependence on Russian fossil fuels since 2022, but it remains a large net importer of energy. This dependence is not confined to one supplier or one fuel. It concerns oil, petroleum products, natural gas, liquefied natural gas, coal for certain industrial

[444] International Law Commission, Draft Principles on Protection of the Environment in Relation to Armed Conflicts, with Commentaries, in Report of the International Law Commission on the Work of Its Seventy-Third Session, UN Doc. A/77/10, 2022; United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law Nairobi: UNEP, 2009).

[445] World Bank, Government of Ukraine, European Union and United Nations, Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025 (Washington, DC: World Bank, 2026); World Bank, Government of Ukraine, European Union and United Nations, Ukraine Rapid Damage and Needs Assessment: February 2022 – February 2023 (Washington, DC: World Bank, 2023); World Bank, Government of Ukraine, European Union and United Nations, Ukraine Rapid Damage and Needs Assessment: February 2022 – December 2023 (Washington, DC: World Bank, 2024).

uses, and the infrastructure through which these fuels enter and move across the European market.[446]

Eurostat's 2026 energy publication records that the EU imported 57 per cent of its available energy in 2024. Oil and petroleum products accounted for the largest share of EU energy imports, followed by natural gas, solid fossil fuels, electricity and renewable energy. The same statistical material shows that the United States was the largest supplier of EU oil and petroleum-product imports, Norway the largest supplier of natural gas, and Australia the largest supplier of solid fossil fuel imports.[447]

This import dependence is not inherently dangerous in every circumstance. Open economies trade energy, raw materials, goods and services. The security question is not whether Europe imports energy, but whether those imports create concentrated, coercible or strategically unstable dependencies. A diversified import relationship with politically stable partners is different from reliance on a hostile supplier, a single maritime route or a fragile transit corridor. The problem arises when essential energy supplies are controlled by actors willing to exploit dependency, or when the physical route is vulnerable to disruption.[448]

Europe's fossil fuel exposure has several dimensions.

The first is supplier exposure. Before 2022, Russian gas, oil and coal formed a significant part of the EU's energy system. This gave Russia revenue and leverage. The subsequent reduction of Russian imports has reduced that exposure, but it has not eliminated the wider problem of dependence on external fossil fuel suppliers.[449]

The second is price exposure. Even where Europe diversifies suppliers, oil and gas prices are set in international markets. A crisis in the Gulf, an LNG shortage in Asia, disruption in the Red Sea or a refinery outage can affect European prices. Import diversification reduces some risks but does not remove exposure to global fossil fuel price volatility.[450]

The third is route exposure. Oil and LNG move through maritime chokepoints, including the Strait of Hormuz, Bab el-Mandeb and the Suez Canal. Pipeline imports depend on fixed routes and transit states. A European strategy based heavily on LNG reduces dependence on Russian pipelines but increases exposure to shipping routes, cargo competition and global LNG market tightness.[451]

[446] Eurostat, *Energy 2026 — Interactive Publication* (Luxembourg: Publications Office of the European Union, 2026); European Commission, Directorate-General for Energy, *EU Energy in Figures: Statistical Pocketbook 2025* (Luxembourg: Publications Office of the European Union, 2025).

[447] Eurostat, *Energy 2026 — Interactive Publication* (Luxembourg: Publications Office of the European Union, 2026); Eurostat, 'Energy Imports Dependency', Eurostat Statistics Explained, accessed 4 June 2026.

[448] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy*, vol. 75, 2014, pp. 415–421.

[449] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022).

[450] International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

[451] Ibid.

The fourth is infrastructure exposure. LNG terminals, storage sites, ports, refineries, pipelines, interconnectors, offshore platforms and electricity substations are critical assets. Damage to them can disrupt supply and raise prices. As the Nord Stream sabotage showed, infrastructure in European waters is not immune from attack or covert action.[452]

The fifth is sectoral exposure. Transport remains heavily dependent on oil. Heavy industry uses gas, coal, coking coal, petroleum products and electricity. Agriculture depends on diesel, fertilisers and logistics. Military mobility remains fuel-intensive. Even if electricity generation becomes cleaner, other sectors may remain exposed unless electrification and demand reduction proceed at scale.[453]

This structural exposure explains why Europe's energy transition cannot be understood only as climate policy. Renewable generation, efficiency, electrification and storage reduce emissions, but they also reduce dependence on imported fossil fuels. The Commission's recent energy-security material makes this connection explicitly by presenting renewable energy, energy efficiency and electrification as ways to reduce dependence on expensive energy imports and strengthen resilience.[454]

The strategic issue is therefore not whether Europe has reduced Russian fossil fuel dependence. It has. The issue is whether Europe can reduce the wider strategic vulnerability created by imported fossil fuels as a category. That requires a policy approach that goes beyond emergency diversification and addresses demand, infrastructure, market design, industrial policy, defence planning and external partnerships.

8.2 The strategic shock of Russia's full-scale invasion of Ukraine

Russia's full-scale invasion of Ukraine in February 2022 was a strategic shock for European energy policy. It exposed the security consequences of a dependency that had often been treated as commercial, manageable or mutually beneficial. Russian fossil fuels were no longer merely supplies in a market. They became part of a wider system of coercion, war finance and geopolitical pressure.[455]

Before the invasion, Russian gas played a major role in the European energy system. Russian oil and coal were also significant. These imports supported European industry and households, but they also generated revenue for the Russian state. The relationship was defended by some on grounds of economic efficiency, long-term contracts and assumed

[452] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[453]Eurostat, *Energy 2026 — Interactive Publication* (Luxembourg: Publications Office of the European Union, 2026); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[454] European Commission, Directorate-General for Energy, 'Focus: EU Energy Security Explained', European Commission, Brussels, accessed 4 June 2026; European Commission, Directorate-General for Energy, 'A More Secure and Stable Energy System', European Commission, Brussels, accessed 4 June 2026.

[455] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Council, *ersailles Declaration*, Versailles, 10–11 March 2022.

interdependence. The assumption was that Russia's need for revenue would restrain its use of energy as leverage.[456]

The invasion showed the limits of that assumption. Russia was willing to bear economic costs in pursuit of strategic aims. It reduced or halted gas supplies to European states, demanded rouble payment mechanisms, created uncertainty around pipeline flows and contributed to a major gas-price crisis. Europe had to respond under pressure, seeking alternative supplies while maintaining support for Ukraine and protecting households and industry.[457]

The shock was strategic in several respects:

1. It revealed that energy dependence can constrain foreign policy. States heavily dependent on Russian energy faced greater pressure when considering sanctions, military assistance to Ukraine and emergency energy measures.
2. It showed that market integration does not prevent coercion. A supplier embedded in European markets can still act politically if state strategy overrides commercial incentives.
3. It exposed weaknesses in infrastructure planning. Some Member States had more LNG access, interconnectors and storage than others. Vulnerability varied sharply across Europe.
4. It demonstrated that energy prices can become a tool of political pressure. The crisis affected inflation, public spending, industrial competitiveness and public confidence.
5. It reframed decarbonisation. Renewable energy and efficiency became instruments of strategic autonomy as well as climate policy.[458]

The EU's response was rapid by historical standards. REPowerEU was launched to reduce dependence on Russian fossil fuels and accelerate the clean-energy transition. Commission material records that Russian gas imports fell sharply after 2021, while Russia's share of EU gas imports also declined substantially. Russian coal imports were banned under sanctions, and Russian crude oil imports fell sharply under sanctions and diversification measures.[459]

The later REPowerEU roadmap records further reductions, stating that the EU's dependency on Russian gas fell from 45 per cent of overall imports before the full-scale invasion to

[456] Thane Gustafson, *The Bridge: Natural Gas in a Redivided Europe* (Cambridge, MA: Harvard University Press, 2020).

[457] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[458] European Commission, REPowerEU Plan, COM(2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[459] European Commission, 'REPowerEU: Three Years On — Commission Takes Stock of Progress to Phase Out Russian Fossil Fuels', European Commission, Brussels, 2025; European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026.

around 12 per cent by 2025, while Russian coal imports were removed through sanctions and Russian oil imports were reduced to a small share of EU imports.[460]

These figures show the scale of Europe's adjustment. They also show the scale of the original exposure. A supplier accounting for almost half of the EU's gas imports before the crisis had a position of major strategic significance. The lesson is not only that Russia was an unreliable supplier. It is that dependence on a major strategic adversary should never have been allowed to reach that level.

The shock also demonstrated Europe's capacity to adapt. Demand fell, LNG imports increased, storage rules were strengthened, renewables expanded, coal use was temporarily adjusted in some markets, and households and industry changed consumption. However, the cost of adaptation was high. Governments spent heavily to cushion consumers and companies. Industrial users faced major cost pressures. Some energy-intensive production was curtailed or relocated. The crisis therefore showed that resilience built before conflict is cheaper than emergency adjustment during conflict.[461]

8.3 REPowerEU and the reduction of Russian fossil fuel imports

REPowerEU is the central EU policy response to Russia's weaponisation of energy and the strategic consequences of the invasion of Ukraine. It was designed to reduce dependence on Russian fossil fuels, diversify supplies, save energy and accelerate the deployment of clean energy. It therefore sits at the intersection of energy security, climate policy, industrial policy and foreign policy.[462]

The Commission describes REPowerEU as a plan to make Europe independent from Russian fossil fuels and to accelerate the clean-energy transition. The later roadmap sets out a structured process for phasing out Russian energy imports and improving the monitoring of potential energy dependencies. Council and Parliament action in 2025 moved this process towards a legally binding phase-out of Russian gas imports.[463]

REPowerEU's significance lies in its dual logic. It does not treat diversification and transition as separate projects. It links them. The immediate problem was Russian supply; the long-

[460] European Commission, Roadmap towards Ending Russian Energy Imports, Brussels, 6 May 2025; Council of the European Union, 'Council Agrees Its Position on Rules to Phase Out Russian Gas Imports under REPowerEU', Brussels, 20 October 2025.

[461] Giovanni Sgaravatti, Simone Tagliapietra, Cecilia Trasi and Georg Zachmann, 'National Fiscal Policy Responses to the Energy Crisis', Bruegel Dataset, accessed 4 June 2026; European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

[462] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission, 'REPowerEU: Affordable, Secure and Sustainable Energy for Europe', European Commission, accessed 4 June 2026.

[463] European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025; European Parliament, *Legislative Resolution of 17 December 2025 on the Proposal for a Regulation of the European Parliament and of the Council on Phasing Out Russian Natural Gas Imports, Improving Monitoring of Potential Energy Dependencies and Amending Regulation (EU) 2017/1938*, COM(2025)0828, C10-0123/2025, 2025/0180(COD), Brussels, 17 December 2025.

term problem was fossil dependence. The strategy therefore combined alternative imports with demand reduction, renewables, energy savings and infrastructure measures.[464]

The reduction of Russian coal was the most straightforward. Coal imports from Russia were banned under sanctions. Coal markets are more flexible than pipeline gas markets, and Russian coal could be replaced more easily than Russian gas in many cases, although at a cost.[465]

Oil was more complex. The EU restricted seaborne Russian crude and petroleum products, while pipeline oil presented difficulties for certain landlocked and refinery-dependent Member States. Oil also remained globally traded, allowing Russia to redirect volumes to other buyers. This made price caps, shipping restrictions and enforcement against circumvention necessary.[466]

Gas was the most politically and economically sensitive. Pipeline gas dependence had been built over decades. Some Member States had limited alternatives. Replacing Russian gas required LNG imports, alternative pipeline supplies, demand reduction, storage, interconnectors and accelerated clean energy. Gas dependence therefore became the central test of European energy resilience.[467]

The REPowerEU experience provides several lessons:

1. Demand reduction is a security instrument. Europe did not reduce Russian gas dependence only by buying gas elsewhere. It also reduced consumption. Lower demand reduces the volume that must be imported and weakens supplier leverage.
2. Renewables improve security where they displace imported fossil fuels. Domestic wind and solar generation reduce the need for gas-fired power and imported fuel.
3. Storage matters. High storage levels before winter reduce vulnerability to supply cuts.
4. Infrastructure flexibility matters. LNG terminals, reverse-flow pipelines and interconnectors allow gas to move where it is needed.
5. Policy co-ordination matters. Unco-ordinated purchasing or national measures can raise prices and weaken solidarity.

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[464] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas* (Paris: IEA, 2022).

[465] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; International Energy Agency, *Coal 2024: Analysis and Forecast to 2027* (Paris: IEA, 2024).

[466] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[467] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

6. Sanctions and energy policy must be aligned. Reducing Russian revenue requires both import restrictions and alternatives for consumers.[468]

REPowerEU also shows that transition policy can accelerate under security pressure. Measures that had been debated for years gained urgency once energy dependence became a strategic liability. However, crisis-driven acceleration can also create risks. Emergency LNG infrastructure, new long-term supply contracts and temporary fossil fuel measures may create lock-in if not carefully managed.[469]

The future of REPowerEU should therefore be judged by whether it reduces fossil dependence structurally. A successful strategy is not one that merely replaces Russian gas with non-Russian gas. It is one that reduces the role of gas in the European economy, strengthens grids, expands storage, electrifies demand and integrates energy security into wider strategic planning.

[468] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

[469] European Commission, REPowerEU Plan, COM(2022) 230 final, Brussels, 18 May 2022; European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

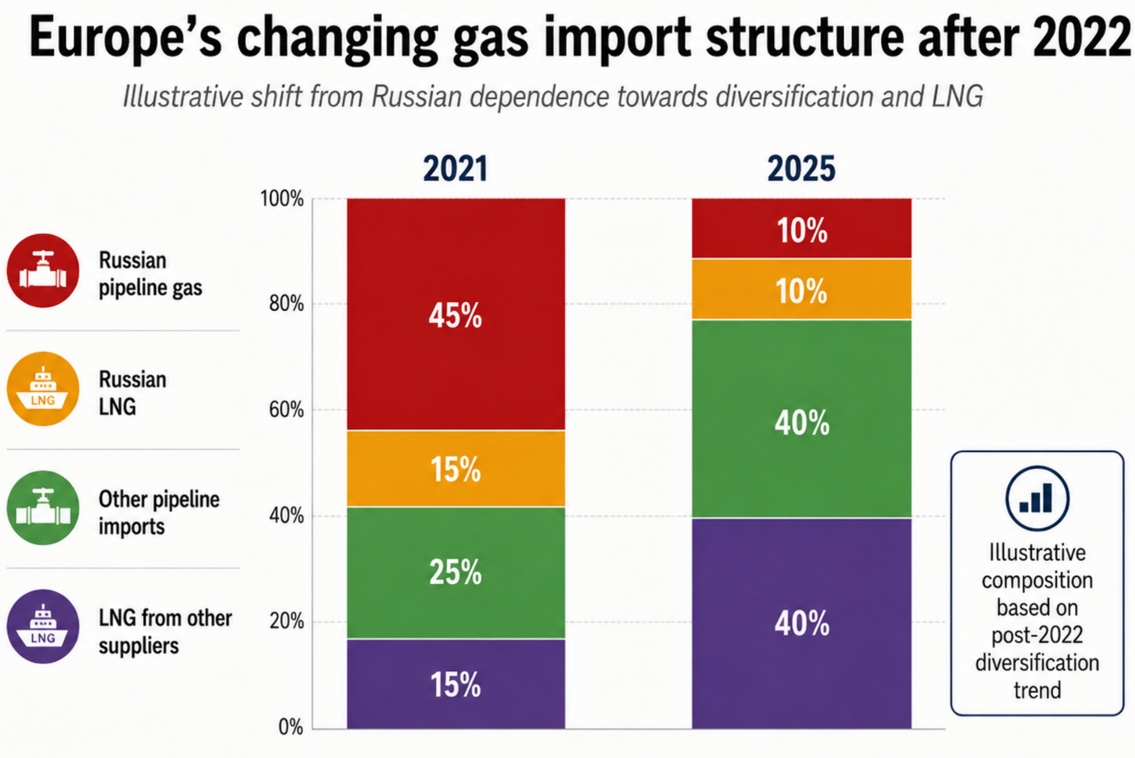

Figure 4. Europe's changing gas import structure after 2022. The EU sharply reduced its dependence on Russian gas after the full-scale invasion of Ukraine, but increased reliance on alternative pipeline suppliers and LNG markets.

8.4 LNG diversification and the risk of new dependencies

Liquefied natural gas played an important role in Europe's response to the post-2022 energy crisis. LNG allowed the EU to replace part of the lost Russian pipeline gas with cargoes from the United States, Qatar, Algeria, Nigeria and other suppliers. New floating storage and regasification units helped some Member States increase import capacity quickly. LNG therefore increased flexibility at a moment of acute vulnerability.[470]

However, LNG diversification also carries risks. It can reduce dependence on one pipeline supplier while increasing exposure to global gas markets, shipping routes, liquefaction capacity, regasification terminals and new supplier relationships. If used as a bridge during transition, LNG can improve resilience. If used as a long-term substitute for Russian gas without demand reduction, it can create a new layer of dependence.[471]

[470] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Gas Market Report, Q1 2023* (Paris: IEA, 2023); European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[471] International Energy Agency, Gas Market Report, Q4 2022 (Paris: IEA, 2022); European Court of Auditors, Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response

The first risk is price exposure. LNG is traded in global markets. European buyers compete with Asian buyers. A cold winter in Asia, an outage at a major liquefaction plant, disruption in the Gulf or shipping constraints can raise prices in Europe. Pipeline gas dependence on Russia may decline, but global price volatility remains.[472]

The second risk is route exposure. LNG cargoes move by sea. Some volumes depend on chokepoints such as the Strait of Hormuz, Bab el-Mandeb and the Suez Canal. A disruption affecting Qatari LNG, Red Sea shipping or global tanker availability could affect European supply and prices.[473]

The third risk is infrastructure lock-in. LNG terminals are expensive. Once built, they may create pressure for long-term utilisation. Contracts signed for security reasons may extend beyond the period in which gas demand should be falling.

The fourth risk is supplier concentration. If Europe becomes heavily dependent on a small number of LNG suppliers, it may reproduce some of the strategic vulnerabilities it sought to escape.

The fifth risk is methane intensity. LNG supply chains involve liquefaction, shipping, regasification and upstream production. Methane leakage and energy use can vary significantly by supplier. If climate and methane standards are weak, LNG diversification may undermine environmental objectives.[474]

The sixth risk is competition with developing countries. Europe's ability to pay higher prices may draw LNG cargoes away from poorer importers, creating energy insecurity elsewhere. This can have diplomatic and development implications.[475]

None of these risks means that LNG diversification was wrong. In 2022 and 2023, it was necessary to prevent a deeper supply crisis. The issue is how LNG is governed over the medium term. It should be treated as a transitional resilience tool, not as a permanent replacement for Russian pipeline dependency.

Policy should therefore apply several tests to LNG decisions. New infrastructure should be assessed for long-term utilisation under EU climate targets. Contracts should avoid unnecessary duration and inflexibility. Terminals should be designed for potential future use only where technically and economically credible, such as handling low-carbon gases, though such claims should be scrutinised. Methane standards should be applied to imported

Measures Cannot Be Demonstrated, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[472] International Energy Agency, Gas Market Report, Q4 2022 (Paris: IEA, 2022); International Energy Agency, World Energy Outlook 2024 (Paris: IEA, 2024).

[473] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

[474] International Energy Agency, *Global Methane Tracker 2025* (Paris: IEA, 2025); Regulation (EU) 2024/1787 of the European Parliament and of the Council of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, *Official Journal of the European Union*, L, 2024/1787, 15 July 2024.

[475] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); World Bank, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026).

gas. Supplier concentration should be avoided. Demand-reduction measures should be prioritised alongside LNG procurement.[476]

The key principle is that diversification must not become substitution without transition. Europe's strategic vulnerability declines only when fossil demand falls. LNG can buy time, but it cannot by itself deliver energy sovereignty.

8.5 Demand reduction, efficiency and electrification

Demand reduction is the most direct way to reduce fossil fuel vulnerability. Every unit of gas, oil or coal that Europe does not need to import reduces exposure to coercion, price shocks, chokepoints and fossil-funded aggression. Demand reduction is therefore a security measure as well as an environmental and economic measure.[477]

Energy efficiency has often been treated as a technical or consumer-policy issue. In the security context, it should be elevated. Commission and IEA material both link efficiency to lower energy demand, reduced import requirements and greater resilience. Avoided demand represents avoided import exposure and reduced strategic vulnerability.[478]

Demand reduction operates through several channels.

The first is building efficiency. Insulation, heat pumps, smart controls and district heating can reduce gas demand for heating. This is especially important because winter heating demand has historically shaped gas vulnerability.[479]

The second is industrial efficiency. Energy-intensive industries can reduce consumption through process optimisation, waste-heat recovery, electrification, hydrogen where appropriate, and circular-economy measures.

The third is transport electrification. Electric vehicles, rail investment, public transport, logistics efficiency and modal shift can reduce oil demand. Because oil remains Europe's largest imported energy category, transport is central to security.[480]

The fourth is behavioural and operational change. During crises, lower thermostat settings, peak-demand management and industrial load shifting can reduce short-term pressure. However, long-term policy should not rely primarily on emergency behaviour; it should build structural efficiency.

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[476] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); International Energy Agency, *Global Methane Tracker 2025* (Paris: IEA, 2025).

[477] International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); European Commission, Directorate-General for Energy, 'Focus: EU Energy Security Explained', European Commission, Brussels, accessed 4 June 2026.

[478] European Commission, Directorate-General for Energy, 'Focus: EU Energy Security Explained', European Commission, Brussels, accessed 4 June 2026; International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025).

[479] International Energy Agency, *The Future of Heat Pumps* (Paris: IEA, 2022); European Commission, *EU Save Energy*, COM(2022) 240 final, Brussels, 18 May 2022.

[480] International Energy Agency, *Global EV Outlook 2025* (Paris: IEA, 2025); Eurostat, 'Oil and Petroleum Products: A Statistical Overview', Eurostat Statistics Explained, accessed 4 June 2026.

The fifth is digital demand management. Smart grids, flexible tariffs and demand response can reduce peak loads and integrate renewable generation.[481]

Electrification is closely linked to demand reduction because electric technologies are often more efficient than combustion-based alternatives. Heat pumps can deliver more heat per unit of energy than gas boilers. Electric vehicles use energy more efficiently than internal combustion engines. Industrial electrification can reduce fossil fuel demand where clean electricity is available.[482]

However, electrification also increases the importance of electricity-system resilience. Grids must be expanded and reinforced. Storage, interconnectors and demand response become critical. Cyber security becomes more important. Electrification reduces fossil vulnerability only if the power system is reliable, low-carbon and secure.[483]

Demand reduction also improves sanctions flexibility. A Europe that needs less oil and gas can take stronger action against fossil revenues financing aggression. It can tolerate supply disruption more easily. It can reduce exposure to price spikes. It can support allies without fearing immediate domestic energy crisis.

There is also a fiscal dimension. Energy-price crises require government support for households and industry. Lower fossil demand reduces the scale of future emergency subsidies. Efficiency investment can therefore reduce public-finance risk.[484]

The policy challenge is implementation. Efficiency measures require skilled labour, financing, permitting, consumer trust and stable regulation. Heat-pump deployment depends on electricity prices, building suitability and installation capacity. Industrial electrification requires grid access and investment certainty. Transport electrification requires charging infrastructure and supply chains.

For this reason, demand reduction should be treated as strategic infrastructure policy. It requires the same seriousness as LNG terminals or pipelines. The cheapest unit of imported fossil fuel is the one Europe no longer needs.

8.6 Renewable deployment as an energy security measure

Renewable energy strengthens security when it replaces imported fossil fuels, reduces price exposure and decentralises generation. Wind, solar, hydro, sustainable bioenergy and other

[481] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Union Agency for the Cooperation of Energy Regulators, *ACER Market Monitoring Report 2024: Electricity Wholesale Markets Volume* (Ljubljana: ACER, 2025).

[482] International Energy Agency, *The Future of Heat Pumps* (Paris: IEA, 2022); International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025).

[483] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[484] Giovanni Sgaravatti, Simone Tagliapietra, Cecilia Trasi and Georg Zachmann, 'National Fiscal Policy Responses to the Energy Crisis', Bruegel Dataset, accessed 4 June 2026; European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022.

renewable sources do not require continuous imports of fuel. Once built, they produce energy from domestic resources. This changes the structure of dependence.[485]

The Commission frames the transition towards home-grown renewable and low-carbon energy as part of building a more electrified, cleaner and resilient Europe. Eurostat and Commission energy material show the growing role of renewables in EU energy production and electricity generation.[486]

Renewable deployment contributes to security in several ways:

1. It reduces fossil fuel imports. Wind and solar generation can displace gas-fired power. Electrification powered by renewables can reduce oil and gas demand in transport, heating and industry.
2. It reduces exposure to fuel-price volatility. Renewable generation has high upfront capital cost but low operating fuel cost. It is less exposed to global oil and gas price shocks.[487]
3. It decentralises parts of the energy system. Rooftop solar, community energy, distributed storage and local grids can reduce dependence on centralised fuel flows.
4. It improves balance-of-payments resilience. Money spent on imported fossil fuels leaves the European economy. Investment in domestic generation, grids and efficiency can retain more value within Europe.
5. It reduces the strategic power of fossil fuel exporters. As demand falls, exporters lose leverage and revenue.

However, renewable deployment must be accompanied by system planning. Variable generation requires grids, storage, flexibility and balancing capacity. Without these, high renewable penetration can create reliability problems. Energy security therefore depends not only on building generation capacity but also on building the system around it.[488]

Grid expansion is a major bottleneck. Renewable projects may be delayed because grid connections are unavailable. Cross-border interconnectors are necessary to balance supply and demand across regions. Permitting delays can slow deployment. Public acceptance may be challenged by land use, visual impact or local concerns. These issues must be managed if renewables are to deliver security benefits.[489]

Renewables also require material supply chains. Solar panels, wind turbines, batteries, inverters, transformers and cables depend on minerals, manufacturing and industrial

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[485] International Renewable Energy Agency, *World Energy Transitions Outlook 2024: 1.5°C Pathway* (Abu Dhabi: IRENA, 2024); International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024).

[486] Eurostat, 'Renewable Energy Statistics', Eurostat Statistics Explained, accessed 4 June 2026; European Commission, Directorate-General for Energy, 'A More Secure and Stable Energy System', European Commission, Brussels, accessed 4 June 2026.

[487] International Renewable Energy Agency, *Renewable Power Generation Costs in 2023* (Abu Dhabi: IRENA, 2024); International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024).

[488] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Network of Transmission System Operators for Electricity, *European Resource Adequacy Assessment 2024* (Brussels: ENTSO-E, 2024).

[489] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; European Network of Transmission System Operators for Electricity, *Ten-Year Network Development Plan 2024* (Brussels: ENTSO-E, 2024).

capacity. These dependencies are addressed in Chapter 9, but they should be acknowledged here: renewable deployment improves security only if supply-chain risks are managed.[490]

For Europe, the security value of renewables is strongest when they are linked to demand reduction and electrification. Renewable electricity that displaces gas-fired generation reduces gas imports. Renewable-powered heat pumps reduce heating gas demand. Renewable-powered electric vehicles reduce oil demand. Renewable hydrogen may support some industrial sectors, though it should be targeted where direct electrification is not feasible.[491]

Renewables also have military and resilience applications. Distributed systems and microgrids can provide power to critical facilities, border regions, islands and post-conflict areas. In Ukraine, decentralised power and repairable local systems have become part of resilience thinking. For NATO and EU civil protection, renewable microgrids can support bases, hospitals, water systems and emergency communications.[492]

The conclusion is that renewable deployment should be treated as energy-security infrastructure. It reduces imported fuel dependence, lowers exposure to fossil price shocks and weakens the strategic power of fossil suppliers. But it must be implemented as a system, not as isolated generation capacity.

8.7 Storage, interconnectors and grid resilience

A secure European energy system requires storage, interconnectors and resilient grids. These assets determine whether energy can be moved, balanced and delivered during crisis. They are as strategically important as fuel supply.[493]

Gas storage became highly visible after 2022. Storage allows Europe to absorb supply interruption and manage winter demand. High storage levels reduce the leverage of external suppliers. EU storage rules were therefore an emergency security measure. However, gas storage is a transitional resilience tool. As gas demand declines, the role of storage will change.[494]

Electricity storage is increasingly important as renewables expand. Batteries, pumped hydro, thermal storage, demand response and other flexibility technologies help balance

[490] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

[491] International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024); International Energy Agency, *The Future of Heat Pumps* (Paris: IEA, 2022).

[492] International Energy Agency, 'Ukraine's Energy Security and the Coming Winter', IEA, September 2024; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

[493] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; European Network of Transmission System Operators for Electricity, *Ten-Year Network Development Plan 2024* (Brussels: ENTSO-E, 2024).

[494] Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

variable generation. Without adequate storage and flexibility, renewable deployment may not translate into security.[495]

Interconnectors are central to European solidarity. They allow electricity and gas to move across borders. A Member State facing disruption can receive support from neighbours if infrastructure exists. Without interconnectors, European energy solidarity remains political rhetoric rather than operational capacity.[496]

Grid resilience is the foundation of electrification. As transport, heating and industry electrify, electricity networks become more important to every sector. This creates new security requirements. Grids must withstand storms, cyberattacks, sabotage, equipment failure and high demand. They must integrate distributed generation and storage. They must also expand fast enough to support industrial transition.[497]

Grid vulnerability has several dimensions.

The first is physical vulnerability. Substations, transformers, transmission lines, interconnectors and control centres can be attacked or damaged. Large transformers are difficult to replace quickly.

The second is cyber vulnerability. Grid control systems are digital and interconnected. Cyberattacks can disrupt operations, cause outages or undermine confidence.

The third is supply-chain vulnerability. Transformers, cables, power electronics and grid equipment may depend on limited suppliers.

The fourth is regulatory vulnerability. Slow permitting and underinvestment can leave grids unable to support transition.

The fifth is climate vulnerability. Heatwaves, storms, floods and wildfires can damage infrastructure.

The sixth is market vulnerability. Poor market design can create price spikes or insufficient investment in flexibility.[498]

[495] International Energy Agency, *Batteries and Secure Energy Transitions* (Paris: IEA, 2024); International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[496] Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013, *Official Journal of the European Union*, L 152, 3 June 2022, pp. 45–102; European Network of Transmission System Operators for Electricity, *Ten-Year Network Development Plan 2024* (Brussels: ENTSO-E, 2024).

[497] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[498] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); European Environment Agency, *European Climate Risk Assessment* (Luxembourg: Publications Office of the European Union, 2024).

For NATO and the EU, grid resilience is a strategic issue. Military bases, defence industries, communications, hospitals, water systems, ports and railways all depend on electricity. A hostile actor seeking to weaken European societies may target grids directly or indirectly.[499]

The policy response should include accelerated grid investment, common standards, cyber security obligations, spare transformer reserves, cross-border planning, critical-node protection, distributed backup power and emergency repair capacity. Grid operators should be integrated into national security planning while preserving civilian governance and regulatory oversight.[500]

Storage and interconnectors also have geopolitical value. A Europe with strong interconnections can reduce the ability of any one supplier to isolate a Member State. A Europe with storage and flexible demand can absorb shocks. A Europe with resilient grids can electrify without creating new fragility.

The transition from fossil fuels to electricity shifts the centre of energy security. In a fossil system, security means protecting fuel flows. In an electrified system, it means protecting networks, flexibility and digital control. Europe must prepare for that shift now.

8.8 NATO, maritime security and critical infrastructure protection

NATO has a direct interest in energy security because energy systems support deterrence, military mobility, industrial production and civilian resilience. The Alliance does not manage energy markets, but it does assess strategic risks, support resilience planning, protect critical infrastructure where appropriate, and respond to hybrid threats. Energy security is therefore a civil-military issue.[501]

NATO's role is particularly relevant in three areas: maritime security, critical infrastructure protection and resilience.

Maritime security matters because fossil fuel imports move through sea lanes and chokepoints. NATO members depend on global oil and LNG markets, even if not all routes fall within NATO's geographic area. Disruption in the Gulf, Red Sea, Black Sea or Baltic Sea can affect allied economies and defence readiness. Naval surveillance, mine-countermeasure capabilities, escort operations and maritime intelligence all contribute to energy security.[502]

Critical infrastructure protection has become more urgent since the Nord Stream sabotage. Undersea pipelines, electricity interconnectors, data cables, offshore wind farms, LNG terminals and ports are difficult to protect and often cross jurisdictions. NATO and the EU both have roles, but their responsibilities differ. NATO brings military capabilities, intelligence and deterrence. The EU brings regulation, market oversight, funding

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[499] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026.

[500] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[501] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

[502] NATO, 'Maritime Security', NATO, accessed 4 June 2026; U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

instruments and civil-protection tools. Effective protection requires co-ordination rather than institutional competition.[503]

Resilience is a core NATO concern. Article 3 of the North Atlantic Treaty commits allies to maintain and develop their individual and collective capacity to resist armed attack. In modern conditions, this includes civilian infrastructure, energy supply, cyber resilience and continuity of government. An adversary may attack energy systems to weaken societies without triggering a conventional military response.[504]

The war in Ukraine has shown the military significance of energy infrastructure. Russia's attacks on Ukraine's power system were designed to impose civilian hardship and weaken national resilience. Similar tactics could be used against NATO states through sabotage, cyber operations or covert attacks. Hybrid threats against energy systems should therefore be considered part of deterrence planning.[505]

NATO's role should include assessment of energy infrastructure vulnerabilities; joint exercises involving energy-disruption scenarios; maritime surveillance and protection of sea lanes; support for undersea infrastructure monitoring; intelligence-sharing on hybrid threats; co-ordination with the EU on resilience standards; support for military energy efficiency and alternative fuels where operationally credible; and protection of defence-critical energy supply chains.[506]

Military forces also need to reduce their own energy vulnerabilities. Operational fuel dependence is a constraint. Bases dependent on fragile civilian grids may be vulnerable. Renewable microgrids, storage, efficiency and alternative fuels can improve military resilience, though they must meet operational requirements.[507]

For the EU, NATO's role should be integrated into a wider security framework. The EU has competence over energy markets, infrastructure regulation, sanctions, industrial policy and climate policy. NATO has military and deterrence functions. The overlap is energy resilience. A structured EU-NATO energy-security dialogue should focus on infrastructure, maritime routes, hybrid threats, exercises, intelligence and crisis response.

[503] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats*, JOIN(2023) 8 final, Brussels, 10 March 2023.

[504] North Atlantic Treaty, signed at Washington, DC, 4 April 1949, entered into force 24 August 1949, Article 3; NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026.

[505] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026); NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

[506] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026); NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

[507] NATO, *Climate Change and Security Action Plan* (Brussels: NATO, 2021); NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

The key principle is that energy infrastructure is no longer a rear-area civilian issue. It is part of the strategic environment.

8.9 Hybrid threats against energy systems

Hybrid threats against energy systems combine physical, cyber, economic, informational and legal methods. They are designed to create pressure, ambiguity and disruption without necessarily crossing the threshold of open war. Energy systems are attractive targets because they affect daily life, public trust, industry and defence readiness.[508]

Hybrid threats may include sabotage of pipelines or cables, cyberattacks on grid operators, manipulation of gas flows, disinformation about shortages, acquisition of strategic assets by hostile-linked companies, legal disputes over contracts, drone surveillance of infrastructure, attacks on substations, or covert support for protests against energy projects.[509]

The value of hybrid energy operations lies in asymmetry. A small action can create large effects. Cutting an undersea cable, damaging a pipeline, hacking a grid operator or spreading panic about fuel shortages may impose costs far beyond the resources used. Attribution may be difficult. The attacker may deny involvement, use proxies or exploit criminal networks.

Hybrid threats affect Europe in several ways:

1. They can weaken public confidence. Energy shortages or price spikes are politically sensitive. Disinformation can amplify fear.
2. They can disrupt markets. Even rumours or ambiguous incidents can affect prices and procurement decisions.
3. They can divide allies. States may disagree over attribution, response or risk tolerance.
4. They can test legal frameworks. If an incident falls below the threshold of armed attack, governments may struggle to respond collectively.
5. They can create cumulative pressure. Multiple small incidents can erode resilience over time.[510]

Energy transition changes the target set. Fossil infrastructure remains vulnerable, but new assets become important: offshore wind farms, battery storage, electricity interconnectors, hydrogen infrastructure, smart meters, digital grid platforms and critical mineral supply

[508] Jukka Savolainen, *Hybrid Threats and Vulnerabilities of Modern Critical Infrastructure: Weapons of Mass Disturbance*, Hybrid CoE Working Paper No. 4 (Helsinki: European Centre of Excellence for Countering Hybrid Threats, 2019); NATO, *Strategic Concept 2022* (Brussels: NATO, 2022).

[509] European Union Agency for Cybersecurity, ENISA Threat Landscape: Energy Sector (Athens: ENISA, 2023); Jukka Savolainen, Hybrid Threats and Vulnerabilities of Modern Critical Infrastructure: Weapons of Mass Disturbance, Hybrid CoE Working Paper No. 4 (Helsinki: European Centre of Excellence for Countering Hybrid Threats, 2019).

[510] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

chains. Cyber vulnerability will grow as the energy system becomes more digital and electrified.[511]

The policy response should include several layers.

The first is risk mapping. Governments should identify critical energy assets, ownership structures and dependencies.

The second is resilience standards. Operators should meet minimum physical and cyber security requirements.

The third is intelligence-sharing. Energy companies should receive threat information where appropriate.

The fourth is incident response. Clear protocols should define who acts, who communicates and how cross-border effects are managed.

The fifth is attribution capacity. Forensic, cyber, maritime and intelligence capabilities should be improved.

The sixth is public communication. Governments must counter panic and disinformation quickly.

The seventh is redundancy. Systems should be designed so that single incidents do not cause systemic failure.[512]

Hybrid threats reinforce the central argument of the White Paper. Fossil fuel systems are vulnerable because of centralised flows and fixed infrastructure. Transition systems will be vulnerable in different ways. The objective is not to imagine an energy system without risk, but to build one in which disruption is harder to weaponise and easier to absorb.

8.10 The role of sanctions in reducing fossil fuel war finance

Sanctions are one of Europe's main instruments for reducing fossil fuel revenues available to aggressor states. In the Russian case, sanctions have targeted coal, oil, petroleum products, shipping services, insurance, technology, finance and related sectors. Their purpose is to weaken the revenue base of the Russian war effort while maintaining enough global supply to avoid severe price shocks.[513]

Sanctions against fossil fuel revenue require careful design. A simple ban may reduce direct imports but push volumes elsewhere. A badly calibrated restriction may raise prices and increase the exporter's revenue. A price cap may reduce revenue while maintaining flows,

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[511] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[512] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities, *Official Journal of the European Union*, L 333, 27 December 2022, pp. 164–198.

[513] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

but only if enforcement is effective. Sanctions therefore require market knowledge, shipping data, customs intelligence and co-operation with partners.[514]

Europe's sanctions policy has several components.

The first is import restriction. Bans on Russian coal, seaborne oil and petroleum products reduced direct European purchases.

The second is price-cap co-operation. The G7 price cap sought to limit Russian oil revenue while allowing oil to continue reaching global markets.

The third is services restriction. Shipping, insurance, finance and technical services can be used as enforcement points.

The fourth is anti-circumvention. Measures must address shadow fleets, ship-to-ship transfers, false documentation, third-country refining and re-exports.

The fifth is technology denial. Restrictions on equipment and technology can affect future production capacity.

The sixth is diplomatic engagement. Non-EU buyers and transit states must be engaged if sanctions are to be effective.[515]

Sanctions are not a substitute for energy transition. They are a wartime and coercion-response tool. Their effectiveness increases when Europe needs less fossil fuel. Lower demand gives policymakers more freedom to restrict hostile suppliers without harming European consumers.[516]

Sanctions also have limits. Russia has adapted by redirecting exports, using non-Western shipping channels and selling at discounts. Some buyers benefit from lower prices. Enforcement is uneven. Market incentives favour circumvention where profits are high. Sanctions therefore require continual tightening and monitoring.[517]

There is also a moral and political dimension. If Europe continues to import fossil fuels directly or indirectly from a state waging aggressive war, it weakens its own strategic position. Reducing imports is therefore both a revenue measure and a political signal.

The sanctions experience supports three broader policy lessons:

1. Energy dependence constrains sanctions. A state dependent on the target's energy will seek exemptions or delays.

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[514] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[515] European Commission, 'Frequently Asked Questions on EU Restrictive Measures against Russia', European Commission, accessed 4 June 2026; Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026.

[516] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025).

[517] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026.

2. Sanctions must target net revenue, not only trade symbolism.
3. Transition increases strategic autonomy. A low-fossil Europe can apply sanctions more consistently and credibly.

Sanctions should therefore be integrated into a long-term energy-security doctrine. They are most effective when combined with diversification, demand reduction, infrastructure resilience and international enforcement.

8.11 Lessons from Europe's post-2022 energy adjustment

Europe's post-2022 energy adjustment offers practical lessons for future crises.

The first lesson is that dependence can be reduced quickly when political urgency is high. Russian fossil fuel imports fell sharply after 2022. This contradicted assumptions that Europe could not adjust rapidly. However, rapid adjustment was costly and uneven.[518]

The second lesson is that early resilience is cheaper than emergency response. Europe could adapt, but only through high public spending, emergency procurement and industrial stress. Building diversification, storage, interconnectors and efficiency before crisis would have reduced the cost.[519]

The third lesson is that demand reduction is decisive. Alternative supply mattered, but lower consumption was essential. Efficiency and behavioural change reduced pressure on markets.[520]

The fourth lesson is that solidarity requires infrastructure. Political declarations are insufficient if gas or electricity cannot physically move across borders. Interconnectors, reverse-flow capacity and market integration are necessary for solidarity.

The fifth lesson is that energy transition and security reinforce each other. Renewables, electrification and efficiency reduce exposure to imported fossil fuels.

The sixth lesson is that fossil diversification can create new risks. LNG helped Europe reduce Russian dependence, but it also increased exposure to global gas markets and maritime routes.[521]

The seventh lesson is that storage is strategic. Gas storage levels affected confidence and winter preparedness. Future electricity storage and flexibility will play a similar role.

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[518] European Commission, 'REPowerEU: Three Years On — Commission Takes Stock of Progress to Phase Out Russian Fossil Fuels', European Commission, Brussels, 2025; European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025.

[519] European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024); Giovanni Sgaravatti, Simone Tagliapietra, Cecilia Trasi and Georg Zachmann, 'National Fiscal Policy Responses to the Energy Crisis', Bruegel Dataset, accessed 4 June 2026.

[520] International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); European Commission, 'REPowerEU: Three Years On — Commission Takes Stock of Progress to Phase Out Russian Fossil Fuels', European Commission, Brussels, 2025.

[521] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

The eighth lesson is that sanctions require energy planning. Import restrictions work best when alternatives and demand-reduction measures are available.

The ninth lesson is that infrastructure protection must be upgraded. Nord Stream, cyber threats and attacks on Ukrainian energy systems show that energy infrastructure is a target.[522]

The tenth lesson is that public communication matters. Energy crises create anxiety. Transparent explanation of measures, costs and objectives helps maintain public support.

The eleventh lesson is that Member State exposure differs. Some countries were highly dependent on Russian gas or oil; others were less exposed. EU policy must account for these differences while avoiding permanent exemptions that undermine common strategy.

The twelfth lesson is that the transition must be just and industrially credible. High prices and rapid change can affect households and industries. Support mechanisms should be targeted, temporary and compatible with long-term demand reduction.[523]

Europe's adjustment was therefore both a success and a warning. It showed that vulnerability can be reduced. It also showed that waiting until crisis raises costs. Strategic resilience should be built in advance.

8.12 Towards a European energy-security doctrine

Europe needs an energy-security doctrine that integrates fossil fuel reduction, infrastructure resilience, defence planning, industrial policy and external strategy. Such a doctrine should move beyond the older model of energy security as supply diversification. Diversification remains necessary, but it is insufficient. The central objective should be to reduce strategic dependence on fossil fuels and build a resilient electrified energy system.[524]

A European energy-security doctrine should rest on ten principles:

1. Fossil fuel dependence should be classified as a security vulnerability. This should be reflected in EU and national security strategies, defence planning, sanctions policy and industrial strategy.
2. Demand reduction should be treated as a strategic priority. Efficiency, electrification and behavioural flexibility reduce import exposure and increase policy freedom.

[522] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026).

[523] European Commission, 'The Just Transition Mechanism: Making Sure No One Is Left Behind', European Commission, accessed 4 June 2026; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[524] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

3. Renewable deployment should be treated as security infrastructure. Domestic low-carbon generation reduces dependence on imported fuels and exposure to price shocks.
4. Grids, storage and interconnectors should be accelerated. Electrification without resilient networks would create new vulnerability.
5. Fossil diversification should be transitional and disciplined. LNG and alternative oil supplies may be necessary, but they should not create new long-term lock-ins.
6. Critical infrastructure protection should cover old and new energy systems. Pipelines, LNG terminals and refineries remain critical during transition, while offshore wind, electricity interconnectors, batteries and digital grids become increasingly strategic.
7. Sanctions policy should target fossil revenues that finance aggression. Enforcement must address shadow fleets, re-exports, shipping services, insurance and third-country refining.
8. Critical minerals and clean technology supply chains should be part of energy security. Europe must avoid replacing fossil fuel dependence with unmanaged dependence on concentrated mineral processing or manufacturing.
9. External policy should support producer-country diversification. Fossil fuel exporters in Europe's neighbourhood and wider partnership network may face instability as demand changes. Transition finance and economic diversification can reduce future risks.
10. EU-NATO co-operation should be institutionalised. Energy security requires civilian regulation and military protection. The EU and NATO should co-ordinate on infrastructure, maritime routes, hybrid threats, exercises and crisis response.[525]

Such a doctrine would not imply autarky. Europe will continue to trade energy, materials, technology and services. The aim is not self-sufficiency in every component. The aim is strategic resilience: diversified supply, lower fossil demand, protected infrastructure, flexible systems and reduced exposure to coercion.

The doctrine should also recognise trade-offs. Emergency gas procurement may be necessary in crisis. Some fossil infrastructure may remain needed during transition. Some industries will require time and investment to electrify. Critical mineral supply chains carry environmental and governance risks. Public acceptance cannot be assumed. These constraints should be addressed openly rather than ignored.[526]

The final policy judgement is that Europe's security improves when fossil fuels lose strategic weight. The less oil, gas and coal Europe needs, the less vulnerable it is to supplier coercion,

[525] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[526] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; European Commission, 'The Just Transition Mechanism: Making Sure No One Is Left Behind', European Commission, accessed 4 June 2026.

maritime chokepoints, fossil-funded aggression and energy-price shocks. Energy transition is therefore not a separate environmental agenda. It is a core element of European security policy.

Instrument	Primary purpose	Security relevance	Institutional level
REPowerEU	Reduce dependence on Russian fossil fuels and accelerate clean energy	Links energy security with diversification, efficiency and renewables	European Union
Energy Union governance	Co-ordinate EU energy planning and monitoring	Improves transparency, resilience and policy integration	European Union / Member States
Gas storage regulation	Ensure minimum storage levels before winter	Strengthens crisis preparedness and solidarity	European Union / Member States
TEN-E framework	Guide strategic energy infrastructure investment	Supports interconnectors, grids and cross-border resilience	European Union
Critical Raw Materials Act	Secure supply of strategic minerals and processing capacity	Addresses new transition-era dependencies	European Union
EU sanctions packages	Restrict revenues and trade linked to aggression	Reduces fossil-fuel war finance and coercive leverage	European Union / G7 coordination
Maritime security and infrastructure initiatives	Protect routes, offshore assets and undersea infrastructure	Addresses sabotage, chokepoints and hybrid threats	EU / NATO / Member States

Table 9. EU policy instruments relevant to energy security

Chapter 9

Renewable Energy and the Limits of the Security Argument

9.1 Why the transition does not eliminate geopolitical risk

The transition away from fossil fuels can reduce important security risks, but it does not eliminate geopolitics. A credible security case for renewable energy must begin with that qualification. Renewable energy, electrification, storage and efficiency can reduce dependence on imported oil, gas and coal. They can weaken the coercive power of fossil fuel exporters, reduce exposure to maritime chokepoints, lower vulnerability to fossil fuel price shocks, and limit the fiscal power of some hydrocarbon-dependent states. They do not, however, create an energy system without strategic exposure.[527]

[527] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

The security argument for renewable energy is strongest when it is comparative rather than absolute. The argument is not that solar, wind, batteries, grids and electric vehicles are risk-free. No energy system is risk-free. The argument is that a well-designed renewable and electrified system can reduce specific vulnerabilities associated with fossil fuels: concentrated hydrocarbon reserves, pipeline coercion, oil chokepoints, cartel leverage, fossil-funded aggression and the environmental damage caused by extraction and combustion.[528]

Renewable energy changes the structure of energy security. In a fossil fuel system, states must continuously import physical fuel. Oil, gas and coal must be extracted, transported, refined, shipped, stored and burned. Supply must be maintained every day. A disruption in fuel flow can create immediate consequences for heating, electricity generation, transport, industry, agriculture and military logistics.[529]

In a renewable energy system, the main vulnerabilities shift towards capital equipment, grids, storage, digital control systems, critical minerals, manufacturing capacity and maintenance. Solar panels and wind turbines do not require imported fuel once installed, but their production depends on supply chains. Batteries reduce dependence on oil and gas, but they require lithium, nickel, cobalt, graphite, manganese and other materials. Electricity grids reduce dependence on pipelines and tankers, but they are vulnerable to cyberattack, sabotage, extreme weather and equipment shortages.[530]

This shift matters. Fossil fuel dependence gives leverage to those who control fuel production, transit and pricing. Renewable-energy dependence gives leverage to those who control minerals, processing, manufacturing, grid equipment, software and digital systems. These risks are different. They require different policy responses.

The security advantage of renewables is that many of the new dependencies are, in principle, more manageable over time. Critical minerals can be recycled. Technologies can be redesigned to reduce reliance on scarce inputs. Supply chains can be diversified. Domestic and allied manufacturing capacity can be built. Demand can be managed through efficiency. Grid resilience can be improved. Once renewable assets are built, they do not require continuous fuel imports from a hostile supplier.[531]

By contrast, fossil fuels create a permanent fuel-flow dependency. A gas-fired power plant requires gas throughout its operating life. An oil-dependent transport system requires constant petroleum supply. A coal-fired plant requires continuous coal deliveries. This is

[528] International Energy Agency, ‘Energy Security’, IEA, accessed 4 June 2026; International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (Paris: IEA, 2021).

[529] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Oil Market Report, June 2025* (Paris: IEA, 2025).

[530] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); International Energy Agency, Electricity Grids and Secure Energy Transitions (Paris: IEA, 2023).

[531] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, Official Journal of the European Union, L, 2024/1252, 3 May 2024.

why fossil fuel dependence creates recurring exposure to supply disruption, price shocks and coercive leverage.[532]

The transition therefore reduces one category of strategic vulnerability while creating another. The policy task is to ensure that new dependencies are not allowed to become as concentrated, opaque and coercible as the old ones. That requires deliberate industrial, trade, security and environmental policy. Europe's experience with Russian gas shows the cost of ignoring dependency until crisis. The same mistake should not be repeated in critical minerals, batteries, solar manufacturing, grid equipment or digital energy systems.[533]

This chapter examines the main limits of the renewable-security argument: critical minerals, China-centred supply chains, grid vulnerability, cyber risk, storage, intermittency, land use, permitting, social acceptance and industrial capacity. It then sets out how Europe can manage these risks without weakening the core conclusion: reducing dependence on fossil fuels remains a strategic security objective.

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[532] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', Energy Policy, vol. 75, 2014, pp. 415–421.

[533] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

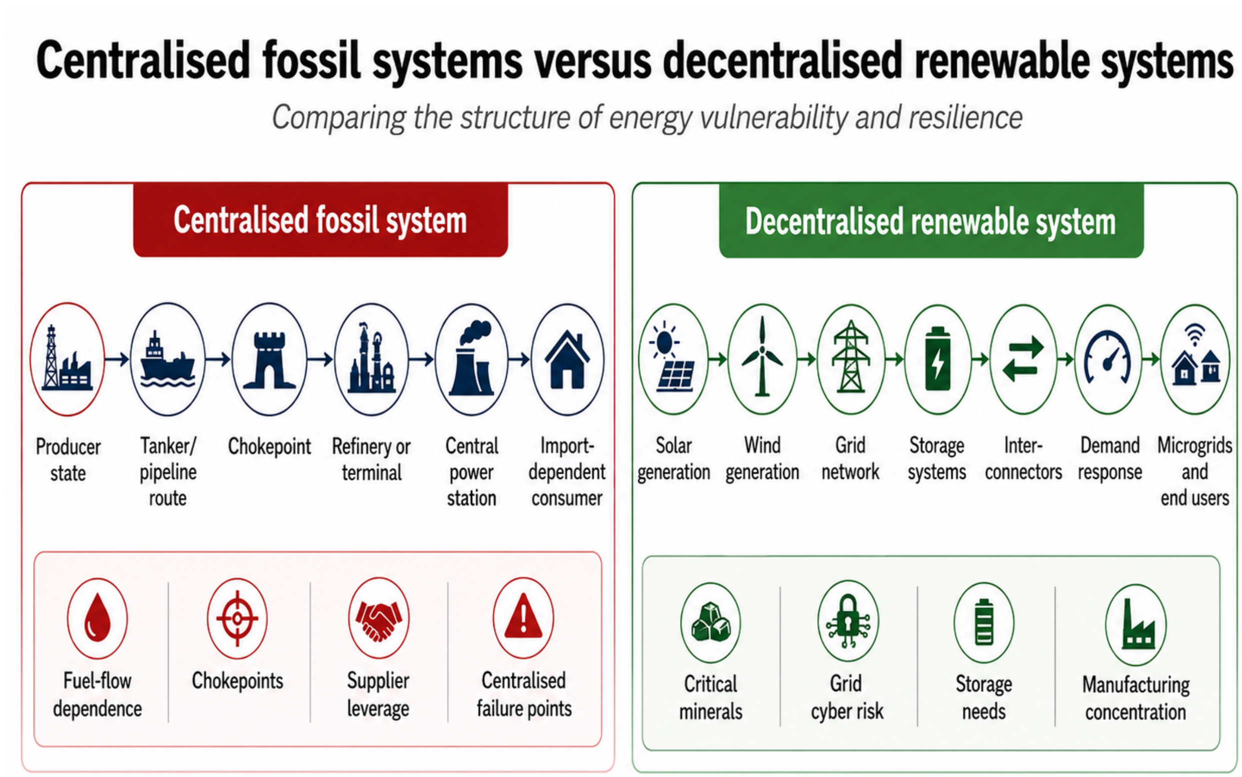

Figure 6. Centralised fossil systems versus decentralised renewable systems. Fossil systems concentrate risk in fuel flows, chokepoints and fixed infrastructure. Renewable systems can reduce these vulnerabilities but require secure grids, storage, critical minerals and supply chains.

9.2 Critical minerals and new supply-chain dependencies

Renewable energy systems depend on critical minerals. Solar panels, wind turbines, batteries, electric vehicles, electricity grids, heat pumps and digital control systems all require minerals and processed materials. These include lithium, cobalt, nickel, copper, graphite, manganese, rare earth elements, silicon, aluminium and others. The exact mineral requirement varies by technology, battery chemistry, grid design and industrial application.[534]

This creates a new energy-security issue. Fossil fuel dependence is about continuous flows of fuel. Critical-mineral dependence is about access to materials needed to build, maintain and expand the energy system. A disruption in mineral supply may not stop existing solar panels or wind turbines from generating power immediately, but it can delay deployment, raise costs, weaken industrial competitiveness and slow the transition.[535]

[534] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (Paris: IEA, 2021).

[535] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

Critical minerals carry several risks.

The first is geographic concentration. Some minerals are mined in a small number of countries. Cobalt production is heavily concentrated in the Democratic Republic of Congo. Lithium production is concentrated in a limited group of countries, including Australia, Chile, Argentina and China. Nickel production is significant in Indonesia, the Philippines, Russia, Canada and Australia. Rare earth mining and processing are heavily linked to China.[536]

The second is processing concentration. Even where mining is geographically diverse, refining and processing may be concentrated elsewhere. This is especially important because raw mineral extraction is only the first step. Batteries, magnets, solar panels and power electronics require processed materials. A country may not control a mine but may still control the refining, separation or component stage on which manufacturers depend.[537]

The third is governance risk. Some mineral-producing regions face corruption, labour abuses, weak environmental regulation, conflict risk or political instability. A transition based on unmanaged extraction could reproduce some of the governance problems associated with fossil fuels.[538]

The fourth is environmental impact. Mining and processing can damage water, land and ecosystems. If poorly managed, critical-mineral extraction can create local opposition and undermine public support for transition. Environmental damage in mineral-producing regions may also generate grievances similar to those seen in fossil-fuel extraction zones.[539]

The fifth is price volatility. Rapid growth in demand can raise prices and create investment cycles. High prices may slow deployment of clean technologies, affect vehicle costs, delay grid investment and weaken industrial competitiveness.

The sixth is strategic leverage. A dominant processor or supplier may use export restrictions, licensing, pricing, industrial policy or informal pressure to gain advantage. Critical minerals are therefore not only commercial inputs. They are strategic materials.[540]

These risks do not invalidate the security case for renewable energy. They require management. The nature of dependence is different. Oil and gas are burned once and must be continuously replaced. Minerals are embedded in equipment and can often be recycled. A battery contains materials that may be recovered at end of life. A wind turbine uses steel,

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[536] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); United States Geological Survey, *Mineral Commodity Summaries 2025* (Reston, VA: US Geological Survey, 2025).

[537] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (Paris: IEA, 2021).

[538] OECD, *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, 3rd edn. (Paris: OECD Publishing, 2016); International Energy Agency, *Sustainable and Responsible Critical Mineral Supply Chains: Guidance for Policy Makers* (Paris: IEA, 2023).

[539] World Bank, Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition (Washington, DC: World Bank, 2020); International Energy Agency, Sustainable and Responsible Critical Mineral Supply Chains: Guidance for Policy Makers (Paris: IEA, 2023).

[540] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

copper and rare earths but does not consume them as fuel. This gives policy more scope for circular-economy strategies.[541]

Europe's Critical Raw Materials Act reflects recognition of the issue. Its 2030 benchmarks aim to increase EU extraction, processing and recycling capacity and to reduce excessive dependence on any single third country for each strategic raw material. The Act does not solve the problem by itself, but it marks an important shift: critical raw materials are now being treated as strategic assets rather than ordinary industrial inputs.[542]

A credible European minerals strategy should include diversified sourcing, domestic and allied processing, recycling, substitution, stockpiling, demand reduction, environmental standards and transparency. It should also avoid a purely extractive approach to partner countries. If Europe seeks minerals from Africa, Latin America or Central Asia, it should support local value addition, environmental safeguards and accountable governance rather than reproducing old resource-dependence patterns.[543]

The critical minerals issue therefore supports a broader conclusion. The energy transition must be treated as an industrial-security project. It is not enough to deploy solar panels and batteries. Europe must secure the supply chains behind them in a way that is resilient, ethical, diversified and compatible with long-term strategic autonomy.

9.3 China's role in clean technology supply chains

China occupies a dominant position in several clean technology supply chains. It is central to solar-panel manufacturing, battery production, rare earth processing, graphite processing, parts of wind technology, power electronics and electric vehicle supply chains. This gives China considerable industrial and strategic influence over the global energy transition.[544]

China's position did not arise by accident. It reflects long-term industrial policy, investment, scale, domestic demand, export capacity, low-cost manufacturing, control over processing, technology development and integration across supply chains. In several sectors, Chinese companies are not only manufacturers but also refiners, component suppliers and global investors.[545]

For Europe, this creates a strategic dilemma. Rapid energy transition requires clean technologies at scale and affordable cost. China can provide many of these technologies.

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[541] International Energy Agency, *Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining* (Paris: IEA, 2024); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

[542] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[543] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Global Gateway*, JOIN(2021) 30 final, Brussels, 1 December 2021; OECD, *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, 3rd edn. (Paris: OECD Publishing, 2016).

[544] International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024); International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[545] International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

However, excessive dependence on China-centred supply chains creates vulnerability. Europe's experience with Russian gas has made policymakers more sensitive to dependency risks. The lesson should not be applied mechanically, but it is relevant: strategic systems should not depend excessively on one external actor.[546]

China-centred dependency has several forms.

The first is manufacturing dependency. If Europe imports most solar panels, batteries or power electronics from China, deployment may depend on Chinese production, pricing and export policy.

The second is processing dependency. Even when raw minerals are mined elsewhere, they may be refined in China. This gives China leverage over intermediate inputs.

The third is technology dependency. Certain manufacturing processes, patents, equipment and specialised components may be concentrated in Chinese firms.

The fourth is market dependency. European companies may rely on Chinese suppliers because alternatives are more expensive or less available.

The fifth is political dependency. If geopolitical relations deteriorate, supply chains may become vulnerable to restrictions, sanctions, counter-sanctions or informal pressure.[547]

The appropriate response is not total decoupling. Full separation from Chinese clean technology supply chains would be costly, slow and potentially damaging to climate and energy-security objectives. The goal should be de-risking: reducing excessive dependence, building European and allied capacity, diversifying suppliers, maintaining trade where safe, and ensuring that critical systems have alternatives.[548]

Europe should therefore distinguish between three categories:

1. Commoditised imports where dependence is manageable because there are multiple suppliers or low strategic sensitivity.
2. Strategic technologies where dependence should be reduced because the component is essential to grid stability, storage, defence infrastructure or industrial resilience.
3. Critical inputs where processing or production concentration creates systemic risk and requires industrial policy.

This approach requires investment. European manufacturing capacity cannot be created by declarations alone. It requires permitting reform, financing, skilled labour, energy-price

[546] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[547] International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

[548] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *A Green Deal Industrial Plan for the Net-Zero Age*, COM(2023) 62 final, Brussels, 1 February 2023.

competitiveness, public procurement, trade defence instruments and predictable demand. The EU's Net-Zero Industry Act, Critical Raw Materials Act and industrial initiatives are steps in this direction, but implementation will determine whether they change dependency patterns materially.[549]

The risk is that Europe could move from dependence on Russian fossil fuels to dependence on Chinese clean technology supply chains. The two dependencies are not identical. China is not exporting fuel that must be burned daily. However, if Europe lacks access to batteries, grid equipment, solar components or critical minerals, its transition could slow and its strategic autonomy could weaken.

The policy conclusion is that renewable deployment and industrial policy must be linked. Energy security requires not only clean generation but also secure supply chains for the technologies that deliver it.

[549] Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724, *Official Journal of the European Union*, L, 2024/1735, 28 June 2024; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

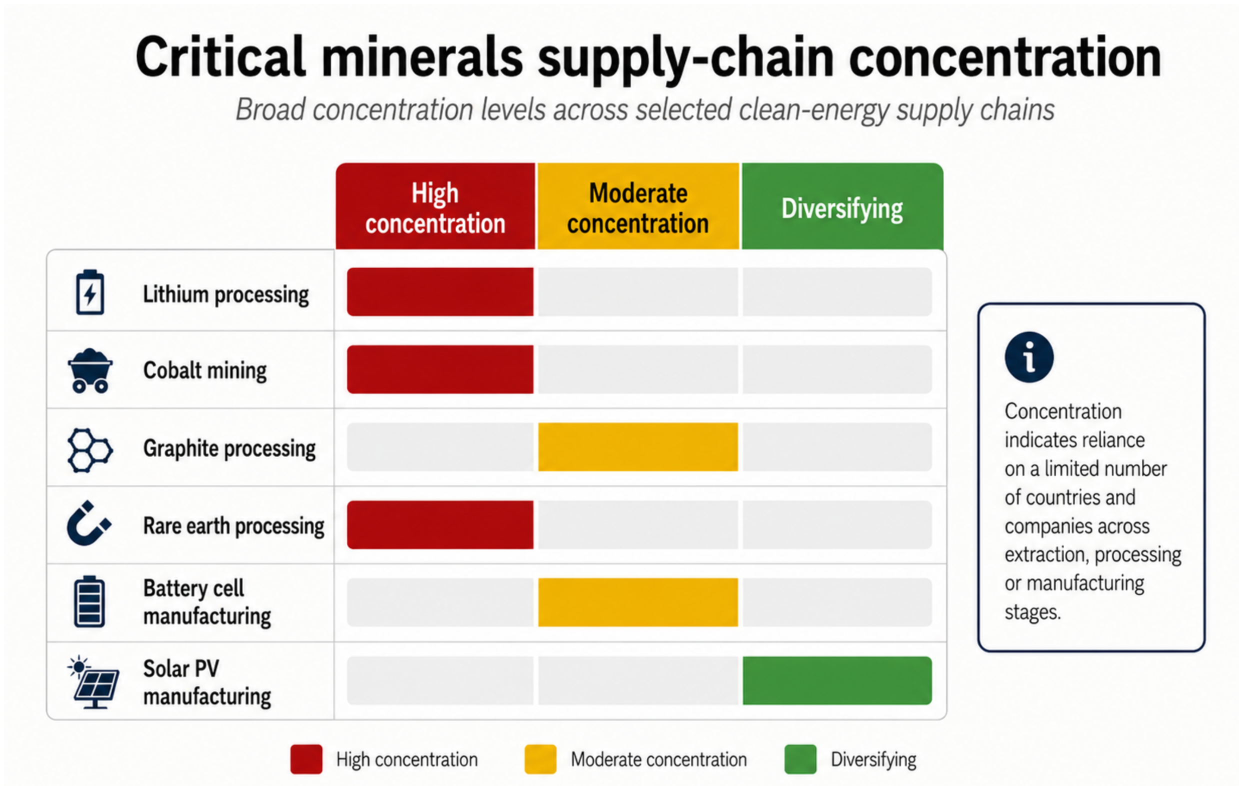

Figure 7. Critical minerals supply-chain concentration. Clean-energy technologies depend on mineral extraction, processing and manufacturing chains that remain concentrated in a limited number of countries and companies.

9.4 Lithium, cobalt, nickel, copper and rare earths

The energy transition increases demand for specific minerals. Each mineral has a different geography, supply chain and risk profile. A serious security analysis must avoid treating "critical minerals" as a single category.[550]

Lithium is central to many battery chemistries, especially lithium-ion batteries used in electric vehicles and stationary storage. Production is concentrated in a limited number of countries, particularly Australia, Chile, Argentina and China. Lithium processing and battery manufacturing are more concentrated still. Supply risk arises from rapid demand growth, permitting delays, water-use concerns, price volatility and processing concentration.[551]

Cobalt is used in some battery chemistries, though efforts are under way to reduce cobalt intensity. Mining is heavily concentrated in the Democratic Republic of Congo, where governance, labour, corruption and human rights concerns have been widely documented.

[550] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); United States Geological Survey, *Mineral Commodity Summaries 2025* (Reston, VA: US Geological Survey, 2025).

[551] Ibid.

Cobalt illustrates the ethical and security challenge of transition: reducing fossil dependence should not rely on opaque or abusive mineral supply chains.[552]

Nickel is important for high-energy battery chemistries and stainless steel. Indonesia has become a major producer and processor, supported by industrial policy and investment. Nickel supply raises environmental concerns, including deforestation, waste management and energy-intensive processing where coal-powered electricity is used. It also illustrates how producer countries may seek to move up the value chain rather than remain raw-material exporters.[553]

Copper is essential to electrification. It is used in grids, motors, transformers, electric vehicles, charging infrastructure and renewable generation. Unlike some battery minerals, copper demand is broad across the entire energy system. Supply expansion is difficult because new mines take years to permit and develop. Copper shortages or price increases could slow grid expansion and electrification.[554]

Rare earth elements are important for permanent magnets used in wind turbines, electric vehicles and defence technologies. Mining and processing are highly concentrated, particularly in China. Rare earth supply is a strategic issue because of its relevance to both clean energy and military systems. Export restrictions or processing bottlenecks could affect multiple sectors.[555]

These minerals differ from fossil fuels in two important respects:

1. They are not burned as fuel. Once incorporated into equipment, they can provide service for years and may be recycled. This reduces continuous import dependence.
2. They can often be substituted or reduced through technology. Battery chemistries can shift. Motors can be designed with lower rare earth content. Recycling can recover materials. Efficiency can reduce demand.[556]

However, substitution takes time. During rapid transition, demand may rise faster than recycling and alternative technologies can scale. This creates a vulnerable period in which mineral supply chains become strategically important.

Europe's policy should therefore be mineral-specific.

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[552] OECD, *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, 3rd edn. (Paris: OECD Publishing, 2016); Amnesty International and Afrewatch, *This Is What We Die For: Human Rights Abuses in the Democratic Republic of the Congo Power the Global Trade in Cobalt* (London: Amnesty International, 2016).

[553] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); World Bank, Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition (Washington, DC: World Bank, 2020).

[554] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); International Energy Agency, Electricity Grids and Secure Energy Transitions (Paris: IEA, 2023).

[555] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); United States Geological Survey, *Mineral Commodity Summaries 2025* (Reston, VA: US Geological Survey, 2025).

[556] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025).

For lithium, the priority is diversified supply, domestic processing where feasible, recycling, and support for alternative battery chemistries.

For cobalt, the priority is reducing dependence through battery chemistry innovation, ensuring responsible sourcing, and supporting governance improvements in producing countries.

For nickel, the priority is environmental standards, diversified processing, and avoiding overdependence on a narrow set of producers.

For copper, the priority is grid planning, recycling, substitution where possible, and strategic investment in supply.

For rare earths, the priority is processing diversification, magnet manufacturing, recycling and strategic stockpiles for defence and energy applications.[557]

Critical minerals policy should also be integrated with development policy. Producer countries should not be treated merely as sources of raw materials. Partnerships should support local processing, environmental standards, labour protections, revenue transparency and economic diversification. Otherwise, the clean-energy transition risks reproducing extractive patterns associated with fossil fuel dependence.[558]

9.5 Grid vulnerability and cyber risk

As Europe electrifies heating, transport and industry, electricity grids become more central to security. A fossil fuel system depends on fuel flows; an electrified system depends on networks. The grid becomes the backbone of the economy. This creates both opportunities and vulnerabilities.[559]

Grid vulnerability has several dimensions.

The first is physical vulnerability. Transmission lines, substations, transformers, interconnectors, control centres and distribution networks can be damaged by storms, fires, floods, sabotage, drones or missile attacks. Large transformers are expensive, specialised and difficult to replace quickly. A targeted attack on a small number of nodes could have wide consequences.[560]

The second is cyber vulnerability. Modern grids rely on digital control systems, sensors, communications, market platforms and automated balancing. Cyberattacks can disrupt

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[557] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, Official Journal of the European Union, L, 2024/1252, 3 May 2024.

[558] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Global Gateway*, JOIN(2021) 30 final, Brussels, 1 December 2021; OECD, *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, 3rd edn. (Paris: OECD Publishing, 2016).

[559] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

[560] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

operations, manipulate data, shut down systems or undermine confidence. As distributed generation, smart meters, electric vehicles and demand response grow, the digital attack surface expands.[561]

The third is supply-chain vulnerability. Grid equipment, transformers, cables, power electronics and control systems may depend on limited suppliers. Delays in procurement can slow grid expansion and recovery after damage.

The fourth is capacity vulnerability. Electrification increases demand. If grids are not expanded and reinforced, bottlenecks can delay renewable projects, industrial investment and electric-vehicle charging.[562]

The fifth is market vulnerability. Electricity markets must reward flexibility, storage and reliability. Poor market design can create price spikes, underinvestment or insufficient reserve capacity.

The sixth is climate vulnerability. Heatwaves increase cooling demand and reduce transmission efficiency. Storms and floods can damage infrastructure. Wildfires can force power shut-offs. Climate change therefore affects the reliability of the electrified system.[563]

Grid cyber risk is especially important because it allows hostile actors to create disruption without direct military attack. A cyber operation may target grid operators, energy traders, billing systems, industrial control systems, communications links or equipment suppliers. It may be designed to cause outage, steal information, prepare future access or create uncertainty.[564]

The policy response should include mandatory cyber standards, stress testing, segmentation of control systems, incident reporting, supply-chain security, red-team exercises, and close co-operation between grid operators and national security agencies. Cyber resilience should be treated as a condition of energy transition.

Physical resilience also needs investment. Substations and transformers should be protected where they are critical. Spare equipment should be stockpiled. Cross-border repair assistance should be planned. Black-start capability should be maintained. Distributed

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[561] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); NATO Cooperative Cyber Defence Centre of Excellence, *Cyber Threats and NATO 2030: Horizon Scanning and Analysis* (Tallinn: CCDCOE, 2020).

[562] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; European Network of Transmission System Operators for Electricity, *Ten-Year Network Development Plan 2024* (Brussels: ENTSO-E, 2024).

[563] European Environment Agency, *European Climate Risk Assessment* (Luxembourg: Publications Office of the European Union, 2024); Intergovernmental Panel on Climate Change, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2022).

[564] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); NATO Cooperative Cyber Defence Centre of Excellence, *Cyber Threats and NATO 2030: Horizon Scanning and Analysis* (Tallinn: CCDCOE, 2020).

generation and microgrids should be used to support critical facilities such as hospitals, military bases, water systems and emergency centres.[565]

The grid issue shows why the security argument for renewables must be system-based. Building more wind and solar capacity does not automatically create security if the grid cannot absorb, balance and protect that generation. A secure transition requires generation, grids, storage, demand response and cyber protection together.

For Europe, grid resilience should be treated as strategic infrastructure comparable to ports, pipelines or defence logistics. It is central to the functioning of the state.

9.6 Storage, intermittency and system reliability

Renewable energy systems require storage and flexibility because wind and solar output vary with weather and time of day. This is often described as intermittency, though the more precise policy issue is variability. A secure electricity system must balance supply and demand at all times. As variable renewables increase, balancing becomes more important.[566]

This challenge is manageable, but it is real. A credible White Paper should not dismiss concerns about reliability. Instead, it should explain that reliability depends on system design.

Storage can take several forms.

Battery storage can provide short-duration balancing, frequency response and support for local grids. It is well suited to managing daily fluctuations, although current battery systems are not by themselves a complete answer to seasonal storage.

Pumped hydro can provide large-scale storage where geography permits. It is mature and reliable but limited by site availability, permitting and environmental concerns.

Thermal storage can support heating and industrial processes.

Hydrogen and synthetic fuels may provide long-duration storage for certain applications, though costs, efficiency losses and infrastructure needs are substantial.

Demand response can shift consumption to periods of high renewable output. Electric vehicles, heat pumps, industrial processes and smart appliances can contribute if managed properly.

Interconnectors allow regions to balance each other. Wind in one area, solar in another and hydro in another can complement each other.

[565] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

[566] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); European Network of Transmission System Operators for Electricity, *European Resource Adequacy Assessment 2024* (Brussels: ENTSO-E, 2024).

Firm low-carbon power, including nuclear, hydro, geothermal or fossil plants with credible abatement where available, may contribute to system reliability depending on national circumstances.[567]

The reliability challenge has several security implications:

1. Insufficient storage or flexibility could create dependence on gas-fired backup. If Europe builds renewables but retains gas as the main balancing fuel, fossil vulnerability persists.
2. Storage supply chains create new dependencies. Batteries require minerals and manufacturing capacity. Hydrogen requires infrastructure and electricity.
3. Extreme weather can reduce output across regions. Periods of low wind and low solar require planning.
4. Market design must reward flexibility. If storage and demand response are not financially viable, they will not scale.
5. Public trust depends on reliability. If the transition is associated with outages or price spikes, public support may weaken.[568]

A secure transition should therefore include capacity planning, flexibility markets, storage targets, interconnection, grid reinforcement and demand response. It should also retain emergency planning for rare events. The goal is not to pretend that variability does not exist, but to build a system that manages it.

Fossil fuel systems also have reliability problems. Gas pipelines can be cut. Oil routes can be disrupted. Coal supply can be delayed. Refineries can fail. Fossil fuel reliability depends on continuous supply chains that are exposed to geopolitics. Renewable variability is a technical and system-management challenge; fossil fuel dependence is a geopolitical and supply-chain challenge. Both must be managed, but they are different.[569]

The policy conclusion is that storage and flexibility are not optional additions to renewable energy. They are core security infrastructure.

9.7 Land use, permitting and social acceptance

Renewable energy infrastructure requires land, sea space, planning approval and public consent. Wind farms, solar parks, transmission lines, battery facilities, substations, mines, processing plants and storage sites all have local impacts. If these impacts are poorly managed, the transition can face delays, litigation, political opposition and social resistance.[570]

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[567] International Energy Agency, *Batteries and Secure Energy Transitions* (Paris: IEA, 2024); International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[568] European Union Agency for the Cooperation of Energy Regulators, *ACER Market Monitoring Report 2024: Electricity Wholesale Markets Volume* (Ljubljana: ACER, 2025); European Network of Transmission System Operators for Electricity, *European Resource Adequacy Assessment 2024* (Brussels: ENTSO-E, 2024).

[569] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[570] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable

Land use is a security issue because delayed deployment prolongs fossil fuel dependence. A wind farm blocked for years, a transmission line delayed by permitting or a battery project opposed locally can slow the reduction of imported gas and oil demand. Permitting is therefore not merely an administrative matter; it affects strategic resilience.[571]

Public opposition may arise for several reasons. Local communities may object to visual impact, noise, biodiversity concerns, land take, property values or lack of local benefit. Farmers may resist loss of agricultural land. Coastal communities may object to offshore infrastructure. Environmental groups may oppose projects affecting sensitive habitats. Indigenous or local communities may object to mining or processing projects. Residents may distrust developers or government agencies.[572]

These concerns should not be dismissed. A transition imposed without legitimacy can generate political backlash. The security case for renewables does not override democratic process or environmental standards. It requires better planning.

Several principles should guide policy:

1. Permitting should be faster but not arbitrary. Clear timelines, digital procedures, adequate staffing and early environmental assessment can reduce delay without eliminating scrutiny.
2. Communities should receive benefits. Local ownership, revenue-sharing, reduced energy bills, community funds and employment can improve acceptance.
3. Spatial planning should identify suitable zones. Projects should be steered towards lower-conflict areas where grid access and environmental impact are manageable.
4. Biodiversity and landscape concerns should be addressed early. Poorly sited projects can create unnecessary opposition.
5. Transmission infrastructure should be explained as part of energy security. Public debate often focuses on generation, but grids are essential.
6. Fossil fuel incumbents and hostile actors may exploit local opposition. Disinformation can amplify legitimate concerns into broader anti-transition narratives.
7. Industrial transition should be fair. Regions dependent on fossil industries need investment, retraining and replacement economic activity.[573]

Social acceptance is therefore part of strategic resilience. A transition that lacks public support may stall. A stalled transition prolongs fossil dependence. Conversely, a well-

sources, *Official Journal of the European Union*, L, 2023/2413, 31 October 2023; European Commission, *Guidance to Member States on Good Practices to Speed Up Permit-Granting Procedures for Renewable Energy Projects and on Facilitating Power Purchase Agreements*, SWD(2022) 149 final, Brussels, 18 May 2022; International Renewable Energy Agency, *World Energy Transitions Outlook 2024: 1.5°C Pathway* (Abu Dhabi: IRENA, 2024).

[571] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

[572] International Renewable Energy Agency, World Energy Transitions Outlook 2024: 1.5°C Pathway (Abu Dhabi: IRENA, 2024); European Environment Agency, Renewable Energy in Europe: Key for Climate Objectives, but Air Pollution and Biodiversity Impacts Need Attention, EEA Report No. 6/2016 (Luxembourg: Publications Office of the European Union, 2016).

[573] European Commission, 'The Just Transition Mechanism: Making Sure No One Is Left Behind', European Commission, accessed 4 June 2026; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

managed transition can build public confidence by linking lower bills, local investment, cleaner air and national security.

Europe’s challenge is to accelerate without losing legitimacy. That requires institutional capacity, transparent decision-making and credible benefits for affected communities. Security arguments should be used honestly: renewable infrastructure reduces strategic exposure, but communities still deserve consultation and fair treatment.

9.8 The security value of decentralised generation

Decentralised generation is one of the strongest security advantages of renewable energy. Rooftop solar, community wind, local storage, microgrids, district energy and distributed demand response can reduce dependence on centralised fuel flows and single points of failure. In a crisis, decentralised systems can support critical services even when wider networks are disrupted.[574]

Fossil fuel systems are often centralised. Large power stations, refineries, pipelines, LNG terminals and storage depots concentrate risk. If one major node is damaged, large populations may be affected. Centralisation can be efficient, but it is vulnerable.

Decentralised renewable systems change this logic. A rooftop solar panel does not require a tanker route. A local battery does not require a gas pipeline. A microgrid can support a hospital, military base, water pump or communications node during wider grid disruption. Distributed systems can make it harder for an adversary to disable energy supply through a small number of attacks.[575]

The security value of decentralised generation is especially relevant in four contexts:

1. Frontline and conflict-affected regions. Ukraine has shown the importance of resilient local power when central infrastructure is attacked. Distributed generation and storage can support essential services.
2. Islands and remote regions. Communities dependent on imported diesel are vulnerable to shipping disruption and high costs. Renewables and storage can reduce exposure.
3. Critical facilities. Hospitals, military bases, emergency shelters, water-treatment plants and communications hubs can benefit from local generation and backup storage.
4. Urban resilience. Distributed solar, batteries and demand response can reduce peak loads and provide emergency support.[576]

[574] International Energy Agency, ‘Energy Security’, IEA, accessed 4 June 2026; International Renewable Energy Agency, *World Energy Transitions Outlook 2024: 1.5°C Pathway* (Abu Dhabi: IRENA, 2024).

[575] International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); NATO, ‘Energy Security’, NATO, Brussels, accessed 4 June 2026.

[576] International Energy Agency, ‘Ukraine’s Energy Security and the Coming Winter’, IEA, September 2024; World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026).

Decentralisation is not a substitute for strong grids. A modern economy still requires transmission networks, industrial-scale generation and system balancing. However, decentralisation reduces the consequences of failure at central nodes. The goal is not full self-sufficiency for every building, but layered resilience.

Decentralised systems also have vulnerabilities. They rely on inverters, digital controls, maintenance, cyber security and supply chains. Poorly integrated distributed generation can create grid-management problems. Local systems must therefore be designed to operate safely and securely.[577]

The policy implications are practical. Critical infrastructure should be assessed for local backup power. Public buildings should be evaluated for solar and storage potential. Military facilities should integrate renewables where operationally useful. Microgrid standards should be developed. Cyber security requirements should apply to distributed energy resources. Emergency planning should include local power islands. Financing should support households, municipalities and small businesses, not only large developers.

The strategic value of decentralised generation lies in reducing coercibility. A society that can maintain essential functions during energy disruption is harder to pressure. Decentralised renewable systems are therefore part of civil defence and resilience.

9.9 Recycling, substitution and alternative chemistries

Recycling, substitution and alternative chemistries are central to managing the security risks of clean-energy supply chains. They reduce dependence on primary extraction, lower exposure to concentrated suppliers and mitigate environmental impact.[578]

Recycling is especially important because many clean-energy materials are durable. Batteries, electric motors, wind turbines, solar panels and grid equipment contain metals that can be recovered at end of life. Recycling cannot meet all demand in the early stages of rapid deployment because there is not yet enough end-of-life material. However, over time it can become a major source of supply.[579]

Battery recycling can recover lithium, cobalt, nickel, copper and other materials. Rare earth magnet recycling can reduce dependence on primary mining and processing. Copper and aluminium recycling can support grid expansion. Solar-panel recycling can recover glass, aluminium, silicon and silver, though commercial models are still developing.[580]

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[577] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[578] International Energy Agency, *Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining* (Paris: IEA, 2024); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[579] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024).

[580] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); International Renewable Energy Agency, Geopolitics of the Energy Transition: Critical Materials (Abu Dhabi: IRENA, 2023).

Substitution reduces dependence on scarce or risky materials. Battery chemistries are already shifting. Lithium iron phosphate batteries use no nickel or cobalt and have gained market share in some applications. Sodium-ion batteries may reduce dependence on lithium for certain uses, although performance and commercial scale remain developing. Motors can be designed with lower rare earth content or alternative technologies. Wind turbine designs may reduce rare earth demand.[581]

Alternative chemistries and technologies matter because they reduce strategic rigidity. A system dependent on one mineral or one chemistry is vulnerable. A system with multiple technology pathways is more resilient.

Recycling and substitution also have industrial benefits. European recycling capacity can support domestic value chains, reduce waste, create jobs and improve strategic autonomy. It can also reduce the environmental footprint of transition by lowering demand for new mining.[582]

However, these measures require policy support:

1. Product design should enable recycling. Batteries and equipment should be designed for disassembly and material recovery.
2. Collection systems must be built. Recycling requires access to end-of-life products.
3. Standards and regulation must ensure safety and environmental performance.
4. Investment is needed in processing capacity.
5. Research and development should support lower-risk chemistries.
6. Public procurement can create demand for recycled materials.
7. Trade policy should prevent export of valuable waste streams where domestic recycling is possible and lawful.
8. Strategic stockpiles may be needed for materials critical to defence and energy.[583]

Recycling is not a complete solution. It cannot immediately eliminate mining needs. It may be energy-intensive. It may face technical limits. But it is a major difference between fossil and mineral dependence. Oil and gas are consumed irreversibly. Metals can circulate.

This gives the energy transition a long-term security advantage if circular-economy policy is implemented early. A mature renewable system can rely increasingly on recycled materials, reducing exposure to primary suppliers. A fossil system cannot recycle burned fuel.

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[581] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); International Energy Agency, Batteries and Secure Energy Transitions (Paris: IEA, 2024).

[582] European Commission, A New Circular Economy Action Plan: For a Cleaner and More Competitive Europe, COM(2020) 98 final, Brussels, 11 March 2020; International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024).

[583] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024; European Commission, *A New Circular Economy Action Plan: For a Cleaner and More Competitive Europe*, COM(2020) 98 final, Brussels, 11 March 2020.

9.10 European industrial capacity and strategic autonomy

European strategic autonomy in energy transition depends on industrial capacity. Europe cannot achieve secure decarbonisation if it lacks the ability to manufacture, process, repair, recycle and control critical energy technologies. Importing all major components from concentrated external suppliers would reduce emissions but leave Europe strategically exposed.[584]

Industrial capacity matters across the whole clean-energy system.

Solar manufacturing includes polysilicon, wafers, cells, modules, inverters and mounting systems. Europe has some capacity but remains heavily dependent on imports.

Wind energy requires turbines, blades, towers, gearboxes, generators, rare earth magnets, offshore installation vessels and port infrastructure. Europe has a stronger industrial base in wind than in solar, but it faces cost pressure and competition.

Battery value chains include mining, refining, cathode and anode production, cells, packs, battery management systems and recycling. Europe has sought to build capacity, but competition is intense.

Grid equipment includes transformers, high-voltage cables, switchgear, substations, power electronics and digital control systems. Grid expansion depends on reliable access to these components.

Heat pumps, electric vehicles, electrolysers, industrial electrification equipment and storage systems all require supply-chain resilience.[585]

Strategic autonomy does not mean producing everything domestically. That would be unrealistic and inefficient. It means having enough domestic and allied capacity to avoid coercive dependence, maintain critical systems during crisis and benefit economically from the transition.[586]

Europe's industrial challenge has several components:

1. Energy costs affect manufacturing competitiveness. Clean technology manufacturing requires affordable and reliable electricity.
2. Permitting affects factories as well as renewable projects. Slow approval processes delay industrial capacity.

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[584] European Commission, *A Green Deal Industrial Plan for the Net-Zero Age*, COM(2023) 62 final, Brussels, 1 February 2023; Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724, *Official Journal of the European Union*, L, 2024/1735, 28 June 2024.

[585] International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024); European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

[586] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Commission, *A Green Deal Industrial Plan for the Net-Zero Age*, COM(2023) 62 final, Brussels, 1 February 2023.

3. Financing is essential. Clean technology factories require large capital investment and predictable demand.
4. Skills are needed. Engineers, electricians, technicians, welders, grid planners and recycling specialists are all in demand.
5. Trade policy must balance openness and security. Europe needs imports but must respond to unfair subsidies, dumping or coercive concentration.
6. Public procurement can support domestic and allied resilience where compatible with trade rules.
7. Innovation must be scaled into production. Europe has research strength but often struggles with manufacturing scale-up.
8. Defence and energy industrial policy should be linked. Some supply chains, such as rare earth magnets, power electronics and advanced materials, matter to both sectors.[587]

Strategic autonomy also requires repair capacity. A grid transformer destroyed by sabotage, a wind farm damaged by storm or a battery system affected by cyberattack must be repairable quickly. Stockpiles, spare parts and industrial surge capacity are part of resilience.[588]

The policy goal should be a balanced industrial ecosystem: diversified imports, European manufacturing in critical segments, allied partnerships, recycling capacity, strategic reserves and innovation. Europe should avoid both naïve dependence and unrealistic autarky.

The security argument for transition succeeds only if Europe controls enough of the system to act independently in crisis.

9.11 Managing transition risk without weakening the transition case

This chapter has identified real risks in renewable and electrified energy systems: critical minerals, China-centred supply chains, grid vulnerability, cyber threats, storage requirements, land-use conflicts, social acceptance and industrial capacity gaps. These risks should be taken seriously. They should not, however, be used to weaken the central strategic case for reducing fossil fuel dependence.

The correct conclusion is not that fossil fuels are secure and renewables are risky. Fossil fuels have already demonstrated their security liabilities: coercive supply cuts, war finance, price shocks, chokepoints, infrastructure sabotage, environmental damage and authoritarian rentier power. Renewable systems introduce different risks, but many are more manageable

[587] Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724, *Official Journal of the European Union*, L, 2024/1735, 28 June 2024; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[588] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

through policy because they concern infrastructure, manufacturing, recycling and diversification rather than permanent fuel dependence.[589]

A responsible energy-security strategy should therefore apply the same discipline to the transition that it failed to apply to fossil fuel dependence. It should identify concentration risks early, diversify supply chains, build domestic and allied capacity, protect infrastructure, maintain transparency and plan for shocks.[590]

Several principles follow:

1. Europe should pursue transition with resilience, not transition at any cost. Speed matters, but so do grids, storage, supply chains and public trust.
2. Europe should avoid single-source dependence. This applies to gas, oil, LNG, minerals, batteries, solar components and digital grid systems.
3. Europe should build circularity into the system. Recycling and reuse reduce long-term dependency.
4. Europe should support technology diversity. Different battery chemistries, storage types, generation sources and demand-response tools improve resilience.
5. Europe should integrate cyber and physical security into energy infrastructure from the start.
6. Europe should link industrial policy and energy policy. Deployment targets require manufacturing, skills and supply chains.
7. Europe should maintain democratic legitimacy. Communities affected by renewable infrastructure, grids or mining should be involved and compensated fairly.
8. Europe should apply environmental standards to critical mineral supply chains. The transition should not export pollution and labour abuse to producer countries.
9. Europe should strengthen EU-NATO co-operation on infrastructure protection, cyber threats and resilience.
10. Europe should keep the strategic objective clear: reducing the ability of states and armed groups to exploit fossil fuel dependence.[591]

The transition will not end energy geopolitics. It will change its basis. The old geopolitics was built around oilfields, gas pipelines, coal mines, tanker routes and hydrocarbon rents. The new geopolitics will involve minerals, grids, storage, manufacturing, software and industrial

[589] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023.

[590] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[591] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

capacity. The purpose of policy is to ensure that the new system is less coercible, less polluting and more resilient than the old one.[592]

The final judgement of this chapter is therefore balanced but firm. Renewable energy is not a security cure-all. It requires careful design, investment and governance. Yet the existence of transition risks does not justify continued fossil dependence. It strengthens the case for a managed, diversified and resilient transition. The security objective is not to replace one vulnerability with another, but to build an energy system in which no supplier, route, fuel or technology can be used to hold Europe's strategic autonomy at risk.

Dimension	Fossil-fuel system risks	Clean-energy transition risks	Strategic implication
Supply concentration	Dependence on producers, routes and chokepoints	Dependence on mineral processing and manufacturing hubs	Diversification remains essential in both systems.
Revenue effects	Hydrocarbon rents can finance aggression or repression	Lower direct fuel rents but industrial concentration can create leverage	Transition can reduce rent-funded coercion.
Infrastructure exposure	Pipelines, terminals and refineries are vulnerable to attack and blockade	Grids, interconnectors, storage and digital systems face cyber and physical risks	Risk shifts rather than disappears.
Price volatility	Global oil and gas prices transmit shocks rapidly	Technology and mineral costs can fluctuate, but there is less continuous fuel exposure	Electrification can reduce recurring fuel-price vulnerability.
Environmental harm	Combustion, spills, flaring and wartime damage create major ecological costs	Mining, land use and waste create environmental pressures	Transition lowers some harms but requires better governance.
Strategic autonomy	Import dependence can constrain foreign policy and sanctions	Critical minerals and manufacturing concentration can create new dependencies	Secure transition needs industrial and recycling strategy.

Table 10. Fossil fuel risks versus clean-energy transition risks

592 International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023); International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024).

Chapter 10

Policy Recommendations

10.1 Treat fossil fuel dependence as a formal security vulnerability

The European Union, NATO and their Member States should formally recognise fossil fuel dependence as a strategic security vulnerability. This recognition should be reflected in energy strategy, defence planning, national security reviews, sanctions policy, industrial policy, climate diplomacy and external relations. The objective is not to treat every fossil fuel transaction as a security crisis. It is to ensure that dependence on oil, gas and coal is assessed according to its strategic consequences, including coercion, war finance, infrastructure vulnerability, price exposure and environmental damage.[593]

For too long, fossil fuel dependence has often been framed as a matter of market supply, commercial contract, price management or climate policy. Russia's use of gas against Europe, the role of fossil fuel revenues in sustaining military capacity, disruption around maritime chokepoints, attacks on energy infrastructure, and the environmental consequences of fossil fuel conflict have shown that this approach is insufficient. Fossil fuel dependence affects sovereignty, alliance cohesion, public finances, inflation, military readiness and the ability of democratic states to sustain foreign-policy decisions under pressure.[594]

A formal security classification would require governments to ask a different set of questions when approving energy infrastructure, long-term contracts, import relationships or foreign investment in energy assets. These questions should include: who controls the supply; whether the supplier has a record of coercion or aggression; whether the route is vulnerable to disruption; whether the revenue supports aggression, repression or proxy networks; whether the importer can replace the supply quickly; whether the infrastructure creates long-term lock-in; whether the arrangement weakens allies or transit partners; and whether the dependency is compatible with climate, security and industrial objectives.[595]

This approach should be applied at EU and national level. The European Commission should integrate fossil fuel dependency-risk analysis into Energy Union reporting, REPowerEU implementation, infrastructure planning, external energy relations and economic-security assessments. Member States should include fossil fuel exposure in national risk assessments, security strategies and civil-resilience planning. NATO should treat fuel dependence, energy

[593] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[594] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

[595] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

infrastructure vulnerability and hostile supplier leverage as part of resilience planning under its wider civil-preparedness agenda.[596]

This recommendation would have several practical consequences:

1. Major fossil fuel infrastructure projects should be subject to strategic risk assessment, not only environmental and commercial review. Pipelines, LNG terminals, storage sites, refineries, oil-import terminals and associated port infrastructure can create long-term dependencies. Their security implications should be evaluated before approval.[597]
2. Long-term fossil fuel contracts should be reviewed for geopolitical exposure. Contract duration, supplier concentration, pricing mechanisms, destination clauses, payment requirements, arbitration risk, sanctions compatibility and exit provisions should be assessed.
3. Foreign ownership of critical energy infrastructure should be screened carefully. Ownership or operational control by companies linked to hostile or strategically risky states may create leverage, intelligence risks, data exposure or operational vulnerability.[598]
4. Dependency metrics should be published regularly. These should include import shares by supplier, fuel type, route, infrastructure concentration, storage availability, substitutability and exposure to chokepoints. Aggregated EU-level figures are useful, but Member State-specific exposure should also be tracked.
5. Fossil fuel risk should be linked to transition planning. The highest-risk dependencies should be prioritised for reduction through efficiency, electrification, renewable deployment, storage, interconnection and diversification.

Treating fossil fuel dependence as a formal security vulnerability would not end fossil fuel use overnight. Europe will continue to use oil and gas during the transition. The objective is to make clear that fossil fuel dependence is not a neutral baseline. It is a risk to be managed down over time.[599]

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[596] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission, *State of the Energy Union 2024*, COM(2024) 404 final, Brussels, 11 September 2024.

[597] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013, *Official Journal of the European Union*, L 152, 3 June 2022, pp. 45–102.

[598] European Commission, Guidance to the Member States Concerning Foreign Direct Investment, Free Movement of Capital from Third Countries, and the Protection of Europe's Strategic Assets, C(2020) 1981 final, Brussels, 25 March 2020; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication on a European Economic Security Strategy, JOIN(2023) 20 final, Brussels, 20 June 2023.

[599] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025.

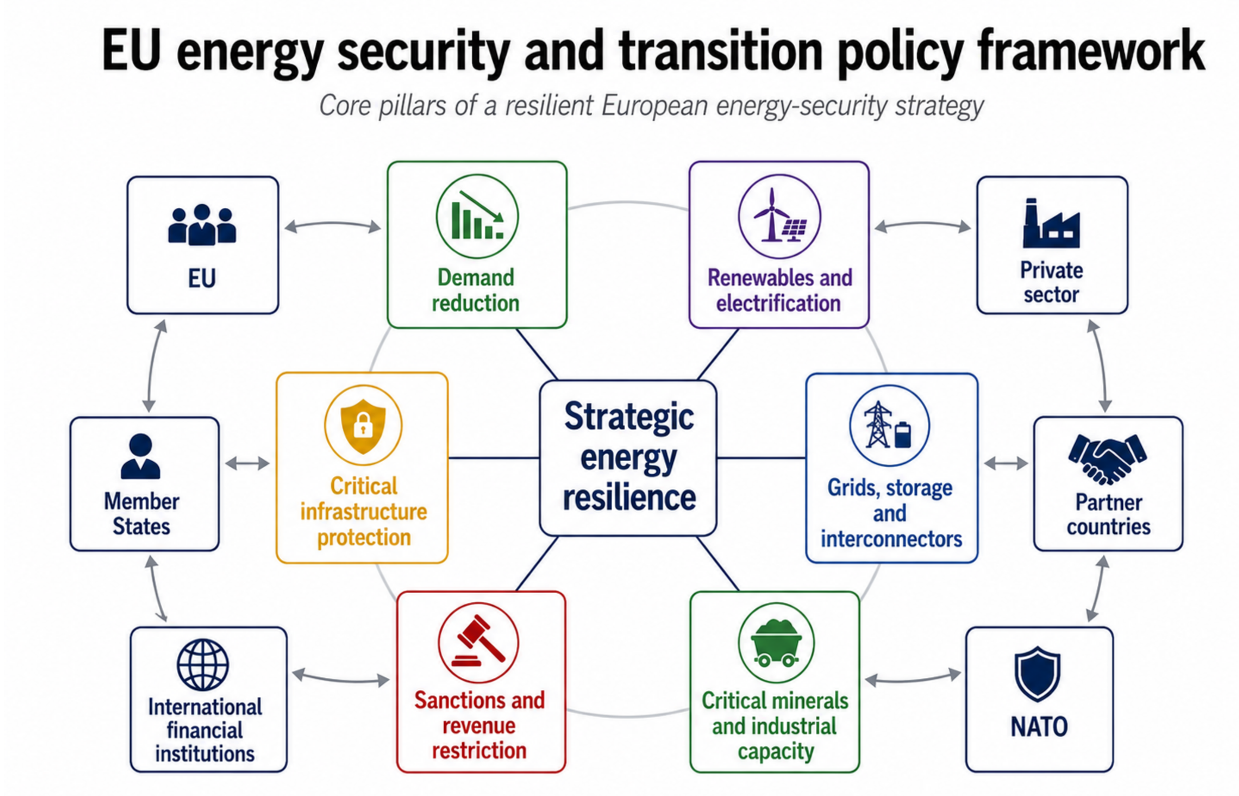

Figure 8. EU energy security and transition policy framework. A resilient European energy-security strategy links demand reduction, clean-energy deployment, infrastructure protection, sanctions policy, critical minerals and industrial capacity.

10.2 Integrate energy transition into defence and foreign policy planning

Energy transition should be integrated into defence and foreign policy planning. It should not be confined to climate ministries, energy regulators or environmental departments. The transition affects deterrence, military logistics, sanctions, industrial resilience, maritime security, critical infrastructure, relations with producer states, and support to fragile partners.[600]

Defence ministries should assess how energy transition affects military readiness and resilience. Armed forces remain heavily dependent on liquid fuels, particularly for aviation, naval operations, heavy vehicles and deployed logistics. However, bases, defence industries, communications networks, rail systems, ports and logistics hubs depend on civilian energy systems. A power outage, gas shortage, refinery disruption, port incident or cyberattack against the grid can affect defence capability. Military planning should therefore include

[600] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023; NATO, *Climate Change and Security Action Plan* (Brussels: NATO, 2021).

energy-system resilience, fuel-supply security, alternative power for bases, local generation, storage and emergency repair capacity.[601]

Foreign ministries should treat energy transition as part of strategic diplomacy. Relations with fossil fuel exporters will change as demand declines. Some producer states may face fiscal stress, social instability or reduced geopolitical leverage. Others may seek to reposition themselves through hydrogen, critical minerals, renewable power, carbon management or industrial diversification. Europe should engage these states early, not only as suppliers but as partners in economic transition.[602]

Sanctions policy should also be linked to energy transition. The ability to restrict fossil fuel revenues that finance aggression depends partly on Europe's own dependence. A Europe that uses less oil and gas has more freedom to impose and sustain sanctions. Energy transition therefore strengthens foreign-policy autonomy.[603]

Development policy should be included as well. Many partner countries depend on fossil fuel exports, fuel subsidies or imported oil. A disorderly global transition could destabilise fragile economies if revenues fall suddenly or energy prices spike. EU external policy should support diversification, public-finance reform, renewable deployment, grid resilience, energy access and transparent resource governance.[604]

At EU level, energy transition should be integrated into the Common Foreign and Security Policy, enlargement policy, neighbourhood policy, Global Gateway investments, sanctions policy, economic-security strategy and defence-industrial planning. At NATO level, energy transition should be incorporated into resilience baselines, civil-preparedness planning, infrastructure protection and military mobility.

Practical measures should include joint energy-security exercises involving defence, energy and civil-protection authorities; regular EU-NATO assessments of fossil fuel dependency risks; integration of energy infrastructure disruption into military and civil contingency planning; support for renewable microgrids and storage at critical facilities; co-ordination between sanctions authorities and energy planners; energy-security dialogues with partner countries vulnerable to fossil revenue decline; and assessment of how energy transition affects defence supply chains.[605]

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[601] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; NATO, *Climate Change and Security Impact Assessment* (Brussels: NATO, 2024).

[602] International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016); World Bank, *Diversified Development: Making the Most of Natural Resources in Eurasia* (Washington, DC: World Bank, 2014).

[603] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022.

[604] World Bank, *State and Trends of Carbon Pricing 2025* (Washington, DC: World Bank, 2025); World Bank, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026); International Energy Agency, *World Energy Outlook 2025* (Paris: IEA, 2025).

[605] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

The policy objective is institutional integration. Energy transition is not only a technical change in generation capacity. It changes strategic relationships. Defence and foreign policy institutions should therefore participate in shaping it.

10.3 Reduce fossil fuel demand through efficiency and electrification

The most durable way to reduce fossil fuel vulnerability is to reduce demand. Supplier diversification, storage and emergency reserves are necessary, but they manage dependence rather than remove it. Efficiency and electrification reduce the volume of fossil fuels that Europe must import, transport, store and protect.[606]

Energy efficiency should be treated as a security measure. Insulation, efficient heating systems, industrial efficiency, efficient appliances, waste-heat recovery and better demand management reduce exposure to gas and oil markets. Each unit of energy saved reduces imports, lowers household vulnerability and increases strategic flexibility.[607]

Buildings are a priority. Heating has been a major driver of European gas demand. Poorly insulated buildings increase vulnerability during winter. Retrofitting buildings, installing heat pumps, improving district heating and using smart controls can reduce gas dependence. These measures also protect households from price shocks and reduce the scale of future emergency subsidies.[608]

Transport is equally important because oil remains central to European energy imports. Electrifying cars, vans, buses and parts of freight transport can reduce oil demand. Rail investment, public transport, logistics efficiency, urban planning and alternative mobility can further reduce exposure. Military and some heavy transport will continue to need liquid fuels for some time, but civilian oil demand can be reduced substantially.[609]

Industry requires a differentiated approach. Some industrial processes can electrify directly. Others may need hydrogen, sustainable biomass, carbon capture or other technologies depending on technical and economic conditions. The security objective is to reduce dependence on imported gas, coal and oil products without weakening European industrial capacity. This requires investment, grid access, stable policy and support for energy-intensive sectors during transition.[610]

Demand reduction should also include peak management. Flexible demand can reduce pressure during crises. Industrial demand response, smart charging, heat storage and time-of-use pricing can lower system stress. However, emergency demand reduction should not

[606] International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); European Commission, *EU Save Energy*, COM(2022) 240 final, Brussels, 18 May 2022.

[607] International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); European Commission, Directorate-General for Energy, 'Focus: EU Energy Security Explained', European Commission, Brussels, accessed 4 June 2026.

[608] International Energy Agency, *The Future of Heat Pumps* (Paris: IEA, 2022); European Commission, *EU Save Energy*, COM(2022) 240 final, Brussels, 18 May 2022.

[609] International Energy Agency, *Global EV Outlook 2025* (Paris: IEA, 2025); Eurostat, 'Oil and Petroleum Products: A Statistical Overview', Eurostat Statistics Explained, accessed 4 June 2026.

[610] European Commission, *A Green Deal Industrial Plan for the Net-Zero Age*, COM(2023) 62 final, Brussels, 1 February 2023; International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024).

substitute for structural investment. A resilient system should not depend on repeated crisis appeals to consumers.

Financing is essential. Efficiency measures often require upfront investment but deliver long-term savings. Public policy should support low-income households, municipalities, small businesses and industries facing high capital costs. The European Investment Bank, national development banks and EU funds should prioritise projects that reduce imported fossil fuel demand.[611]

The security value of demand reduction should be made explicit in public communication. Citizens are more likely to support retrofits, heat pumps, grids and transport changes if they understand that these measures reduce exposure to hostile suppliers, price shocks and war finance.

Demand reduction is the foundation of strategic energy resilience. A state that needs less imported fossil energy is harder to coerce.

10.4 Accelerate renewables, storage and grid expansion

Renewable deployment should be accelerated as a security priority. Wind, solar, hydro, geothermal, sustainable bioenergy and other domestic low-carbon sources reduce dependence on imported fossil fuels. They also reduce exposure to global fuel-price volatility. However, renewable generation alone is not sufficient. It must be accompanied by storage, grid expansion, interconnection and system flexibility.[612]

The EU and Member States should treat grids as strategic infrastructure. Electrification of transport, heating and industry will increase electricity demand. Renewable projects require grid connections. Cross-border trade requires interconnectors. Storage requires market access. Without a stronger grid, renewable deployment will be slowed and electrification will be constrained.[613]

Grid expansion should therefore be accelerated through faster permitting, better planning, public investment, regulatory reform and supply-chain support. Transmission and distribution networks both need attention. Large-scale offshore wind, rooftop solar, electric vehicles, heat pumps and industrial electrification all place different demands on the grid.

Storage should be treated as a central component of security. Battery storage, pumped hydro, thermal storage, demand response and other flexibility tools can reduce reliance on gas-fired balancing. Long-duration storage should be developed where economically and

[611] European Investment Bank, *EIB Energy Lending Policy: Supporting the Energy Transformation* (Luxembourg: European Investment Bank, 2019); European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[612] International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024); International Renewable Energy Agency, *World Energy Transitions Outlook 2024: 1.5°C Pathway* (Abu Dhabi: IRENA, 2024).

[613] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

technically appropriate. Strategic planning should distinguish between short-duration flexibility, seasonal needs and emergency reserve capacity.[614]

Interconnectors are essential for solidarity. A Member State with surplus wind, solar, hydro or nuclear generation should be able to support neighbours during disruption. Energy solidarity requires physical infrastructure. Cross-border electricity and gas links should therefore be assessed through both market and security criteria.[615]

Permitting reform is necessary, but it should not eliminate environmental scrutiny or public participation. Faster procedures can be achieved through clear timelines, adequate staffing, digital processes, pre-identified low-conflict zones and early engagement with communities. Social acceptance is a security requirement because delayed projects prolong fossil dependence.[616]

Renewable expansion should also be linked to domestic and allied industrial capacity. Europe should avoid excessive dependence on single-country supply chains for solar panels, batteries, inverters, transformers, cables and grid equipment. Public procurement, industrial policy and trade tools should support resilient supply chains.[617]

The policy goal should be a system capable of absorbing high renewable shares without compromising reliability. This requires investment in forecasting, balancing markets, storage, demand response, interconnectors, dispatchable low-carbon capacity and cyber-secure grid operations. Renewables strengthen security only when integrated into a resilient system. The EU should therefore move from deployment targets alone to a broader security framework: generation, grids, storage, industry, cyber security and public consent.

10.5 Strengthen protection of critical energy infrastructure

Critical energy infrastructure must be protected against physical attack, sabotage, cyber operations, insider threats, extreme weather and accidents. This includes fossil

[614] International Energy Agency, *Batteries and Secure Energy Transitions* (Paris: IEA, 2024); European Network of Transmission System Operators for Electricity, *European Resource Adequacy Assessment 2024* (Brussels: ENTSO-E, 2024).

[615] Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013, *Official Journal of the European Union*, L 152, 3 June 2022, pp. 45–102; European Network of Transmission System Operators for Electricity, *Ten-Year Network Development Plan 2024* (Brussels: ENTSO-E, 2024).

[616] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, *Official Journal of the European Union*, L, 2023/2413, 31 October 2023; European Commission, *Guidance to Member States on Good Practices to Speed Up Permit-Granting Procedures for Renewable Energy Projects and on Facilitating Power Purchase Agreements*, SWD(2022) 149 final, Brussels, 18 May 2022; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[617] Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724, *Official Journal of the European Union*, L, 2024/1735, 28 June 2024; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

infrastructure that remains necessary during transition and new low-carbon infrastructure that will become increasingly strategic.[618]

The relevant assets include pipelines, LNG terminals, oil terminals, refineries, ports, fuel depots, gas storage sites, electricity substations, transmission lines, interconnectors, undersea cables, offshore wind farms, battery storage, control centres and industrial energy facilities. Many are privately owned or operated, but their failure can have national security consequences.[619]

Protection should begin with risk mapping. Governments should identify critical nodes, single points of failure, ownership risks, cross-border dependencies and emergency-repair requirements. This mapping should be regularly updated and shared with relevant EU and NATO structures where appropriate.

Physical security should be upgraded for high-risk sites. This may include surveillance, access control, drone detection, perimeter protection, emergency shutdown systems, fire suppression, blast protection, redundancy and rapid repair teams. Offshore and undersea infrastructure requires maritime monitoring, seabed surveillance, patrols, satellite data, acoustic sensors and co-operation with private operators.[620]

Cyber security should be mandatory and enforceable. Energy operators should meet high standards for industrial control systems, network segmentation, incident reporting, backup systems, supplier security and recovery planning. Cyber exercises should include grid operators, LNG terminal operators, refineries, storage sites and electricity-market platforms.[621]

Insider threats should not be ignored. Energy infrastructure can be vulnerable to employees, contractors or service providers with access to sensitive systems. Vetting, access controls and monitoring should be proportionate but serious.

Emergency response planning should be improved. Governments should know how essential services would be maintained if a major terminal, pipeline, substation or interconnector failed. Spare parts, especially large transformers and specialised equipment, should be stockpiled or made available through allied arrangements.

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[618] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[619] Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities, *Official Journal of the European Union*, L 333, 27 December 2022, pp. 164–198; NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026.

[620] NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats*, JOIN(2023) 8 final, Brussels, 10 March 2023.

[621] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); NATO Cooperative Cyber Defence Centre of Excellence, *Cyber Threats and NATO 2030: Horizon Scanning and Analysis* (Tallinn: CCDCOE, 2020).

Public-private co-operation is essential. Operators hold technical knowledge; governments hold intelligence and security authority. Information-sharing mechanisms should be strengthened, with clear protocols for threat warnings and incident response.[622]

Infrastructure protection should not become a justification for prolonging fossil dependence. Existing fossil assets need protection during transition, but the long-term strategy should reduce reliance on them. At the same time, new renewable and grid assets must be protected from the beginning, not retrofitted after incidents occur.

The security of energy infrastructure is now central to deterrence, civil protection and economic stability. It should be treated accordingly.

10.6 Improve monitoring of undersea cables, pipelines and offshore assets

Undersea infrastructure has become a major strategic vulnerability. Pipelines, electricity interconnectors, telecommunications cables and offshore energy assets lie across vast maritime areas that are difficult to monitor and protect. The Nord Stream sabotage showed that undersea energy infrastructure in European waters can be attacked. Future offshore wind networks, power cables, hydrogen pipelines and data links will increase the importance of seabed security.[623]

The EU, NATO and coastal states should develop a stronger framework for undersea infrastructure monitoring. This should include mapping, surveillance, intelligence-sharing, incident-response protocols and co-operation with private operators.

The first requirement is a comprehensive inventory. Governments should know where critical cables, pipelines and offshore assets are located, who owns them, who operates them, what they connect, and what impact their disruption would have. Some information must remain sensitive, but authorities need a shared operational picture.

The second requirement is maritime domain awareness. Satellite imagery, patrol aircraft, naval vessels, drones, acoustic sensors, automatic identification system data and commercial shipping data should be integrated to detect suspicious activity near critical infrastructure.[624]

The third requirement is seabed monitoring. Certain high-value areas require dedicated sensors or periodic inspection. This is expensive, so prioritisation is necessary. Interconnector landing points, pipeline junctions, offshore wind hubs and dense cable corridors should receive particular attention.

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[622] Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities, *Official Journal of the European Union*, L 333, 27 December 2022, pp. 164–198; NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026.

[623] NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[624] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats, JOIN(2023) 8 final, Brussels, 10 March 2023; NATO, 'Maritime Security', NATO, accessed 4 June 2026.

The fourth requirement is legal clarity. Undersea infrastructure crosses territorial waters, exclusive economic zones and international waters. Authorities need clear rules for investigation, evidence collection, attribution and response.

The fifth requirement is repair capacity. Undersea cable and pipeline repair requires specialised vessels, equipment and expertise. Europe should assess whether it has sufficient capacity to respond quickly to multiple incidents.[625]

The sixth requirement is EU-NATO co-ordination. NATO has military assets and intelligence capabilities. the EU has regulatory authority, funding tools and energy-market competence. Coastal states have jurisdiction and operational responsibility. The private sector owns much of the infrastructure. Co-ordination must be routine, not improvised.

The seventh requirement is deterrence. Potential attackers should understand that sabotage of critical undersea infrastructure will be investigated, attributed where possible and met with consequences. Ambiguity should not guarantee impunity.

Offshore wind infrastructure deserves special attention. As Europe expands offshore wind, offshore substations, export cables and maintenance vessels will become critical energy assets. These systems are physically exposed and digitally connected. Security requirements should be built into project design, permitting and operation.[626]

Undersea infrastructure protection is not only about fossil fuels. It is part of the transition. As Europe electrifies and decentralises, cables and offshore assets become more important. Protecting them is essential to the security of the future energy system.

10.7 Reinforce EU-NATO co-operation on hybrid energy threats

EU-NATO co-operation on hybrid energy threats should be strengthened and institutionalised. Energy infrastructure sits at the intersection of civilian regulation and military security. The EU and NATO have different competences but overlapping interests. The EU regulates energy markets, funds infrastructure, enforces sanctions and sets climate and industrial policy. NATO addresses deterrence, resilience, military readiness, intelligence and collective defence. Hybrid threats exploit the gap between these domains.[627]

Energy-related hybrid threats may include pipeline sabotage, cyberattacks on grid operators, drone surveillance of infrastructure, manipulation of supply, disinformation about shortages, attacks on undersea cables, coercive pricing, hostile investment in critical

[625] NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026; International Cable Protection Committee, Government Best Practices for Protecting and Promoting Resilience of Submarine Telecommunications Cables (Portsmouth: ICPC, 2021).

[626] European Commission, *An EU Strategy to Harness the Potential of Offshore Renewable Energy for a Climate Neutral Future*, COM(2020) 741 final, Brussels, 19 November 2020; NATO, 'NATO's Role in Protecting Critical Undersea Infrastructure', NATO, Brussels, accessed 4 June 2026.

[627] NATO, *Strategic Concept 2022* (Brussels: NATO, 2022); Jukka Savolainen, *Hybrid Threats and Vulnerabilities of Modern Critical Infrastructure: Weapons of Mass Disturbance*, Hybrid CoE Working Paper No. 4 (Helsinki: European Centre of Excellence for Countering Hybrid Threats, 2019).

assets and support to disruptive proxies. No single institution can address all these threats alone.[628]

A reinforced EU-NATO framework should include regular threat assessments, joint exercises, infrastructure-protection planning, maritime domain awareness, cyber co-operation, strategic communication and crisis-response protocols.

Joint exercises should simulate energy disruption scenarios. These could include simultaneous cyberattack on grid operators, sabotage of an interconnector, drone attack on an LNG terminal, disinformation about fuel shortages and a maritime chokepoint crisis. Exercises should involve governments, energy operators, regulators, military planners and civil-protection authorities.

Information-sharing should be improved. Energy companies often detect anomalies before governments do. Governments may possess intelligence that operators need. EU and NATO mechanisms should facilitate secure and timely sharing without compromising sensitive sources.[629]

Strategic communication should be co-ordinated. Hybrid energy attacks often aim to create panic, confusion and political division. Public messaging after an incident should be accurate, rapid and consistent. Governments should avoid both alarmism and opacity.

EU-NATO co-operation should also address military energy resilience. NATO bases and operations depend on civilian energy networks. The EU's energy transition affects the infrastructure on which NATO forces rely. Co-ordination on grids, fuel supply, military mobility and critical nodes is therefore necessary.[630]

The relationship should avoid duplication. The EU should not attempt to become a military alliance; NATO should not attempt to regulate energy markets. Instead, each should use its strengths. The shared objective is resilience against coercion, sabotage and disruption.

Hybrid threats thrive where responsibility is unclear. A permanent EU-NATO energy-security interface would reduce that ambiguity.

10.8 Target fossil fuel revenues that finance aggression

Fossil fuel revenues that finance aggression, repression or proxy warfare should be targeted through co-ordinated sanctions, trade restrictions, financial measures and enforcement

[628] European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023); Jukka Savolainen, *Hybrid Threats and Vulnerabilities of Modern Critical Infrastructure: Weapons of Mass Disturbance*, Hybrid CoE Working Paper No. 4 (Helsinki: European Centre of Excellence for Countering Hybrid Threats, 2019).

[629] NATO, 'Resilience, Civil Preparedness and Article 3', NATO, Brussels, accessed 4 June 2026; Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities, *Official Journal of the European Union*, L 333, 27 December 2022, pp. 164–198.

[630] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; NATO, *Climate Change and Security Action Plan* (Brussels: NATO, 2021).

mechanisms. The objective should be to reduce net revenue available to hostile actors while limiting avoidable harm to European consumers and global energy stability.[631]

The Russian case is the principal current example. Oil, gas, coal and petroleum-product revenues have contributed to the Russian state's fiscal capacity during its war against Ukraine. European and G7 measures have sought to restrict these revenues through import bans, price caps, shipping-service restrictions and financial sanctions. These measures should be strengthened where circumvention is identified.[632]

Effective fossil revenue sanctions require several principles:

1. Policy should target revenue rather than only volume. A state may export less but earn more if prices rise. Sanctions must be evaluated by their effect on net income.
2. Enforcement must address shipping. Shadow fleets, reflagging, opaque ownership, ship-to-ship transfers and non-compliant insurance can undermine sanctions. Port-state controls, tanker tracking, penalties and insurer scrutiny are essential.[633]
3. Customs data should be used to detect re-exports. Petroleum products refined from sanctioned crude may enter markets through third countries. Rules of origin and product tracing should be improved.
4. Financial channels should be monitored. Banks, traders, insurers and commodity intermediaries can facilitate evasion. Anti-money-laundering tools should be applied to fossil trade where relevant.
5. Sanctions should be co-ordinated internationally. EU measures are more effective when aligned with the G7 and other partners. Diplomatic engagement with major buyers is necessary.
6. Environmental and safety risks should be considered. Shadow fleets may involve older vessels with inadequate insurance, increasing oil-spill risk. Sanctions enforcement should include maritime safety measures.[634]
7. Humanitarian impacts should be assessed. Measures should avoid unnecessary harm to vulnerable importers and should include mitigation where needed.

Fossil revenue targeting should not be limited to states. Non-state armed groups that profit from oil theft, smuggling, illegal refining or extortion should be targeted through sanctions, law enforcement, border security and financial disruption.[635]

[631] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine* (Helsinki: CREA, 2022–2026).

[632] G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[633] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026.

[634] International Maritime Organization, 'Maritime Safety', IMO, accessed 4 June 2026; International Maritime Organization, 'Prevention of Pollution by Oil', IMO, accessed 4 June 2026.

[635] Financial Action Task Force, *Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL)* (Paris: FATF, February 2015).

The EU should also strengthen its capacity to track fossil fuel flows. This includes satellite data, customs information, shipping data, refinery analysis, corporate ownership records and commodity-trade monitoring.

Targeting fossil fuel revenues is not a complete conflict-prevention strategy. Aggressors may adapt, and wars are not financed by energy alone. However, reducing revenue can raise the cost of aggression and limit the resources available for military operations. It is therefore a legitimate and necessary tool.

10.9 Close sanctions loopholes and third-country rerouting channels

Sanctions are only as strong as their enforcement. Fossil fuel sanctions are particularly vulnerable to loopholes because oil and petroleum products are globally traded, fungible and easily rerouted. Closing circumvention channels should be a priority for the EU and its partners.[636]

Third-country rerouting can occur when sanctioned crude is sold to a non-sanctioning state, refined there, and exported as petroleum products. It can also occur when cargoes are blended, re-labelled, transferred between ships or sold through intermediaries. Some rerouting is lawful under existing rules; some may violate sanctions; some may undermine the purpose of sanctions while remaining technically legal. Policymakers should review these distinctions.[637]

The EU should strengthen rules of origin for petroleum products where feasible. If refined products are derived substantially from sanctioned crude, policymakers should consider whether additional measures are necessary. This is technically difficult, but not impossible where trade patterns, refinery inputs and product flows are monitored.

Shipping enforcement should be improved. Vessels involved in deceptive practices, unsafe operations or sanctions evasion should face restrictions. Insurance providers, classification societies, ship managers and port authorities should be required to conduct due diligence. Repeated violators should face penalties.[638]

The shadow fleet requires particular attention. Older vessels operating with opaque ownership and insurance present sanctions and environmental risks. The EU and partners should increase monitoring, impose penalties for unsafe practices, and restrict access to ports and services where legal grounds exist.[639]

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[636] European Commission, 'Frequently Asked Questions on EU Restrictive Measures against Russia', European Commission, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[637] Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026.

[638] United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[639] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026.

Commodity traders should be subject to stronger transparency requirements. Beneficial ownership, cargo origin, pricing and payment structures should be scrutinised when dealing with high-risk fossil fuel flows.

Customs co-operation with third countries should be expanded. Some states may lack capacity to monitor complex fossil fuel trade. Technical assistance, data-sharing and diplomatic engagement can reduce inadvertent facilitation of circumvention.

Sanctions enforcement should also address technology and services. Fossil production depends on equipment, software, engineering, finance and shipping. Restricting access to these inputs can reduce long-term production capacity.[640]

A dedicated EU fossil sanctions enforcement unit could be considered. It would combine energy-market expertise, customs analysis, shipping data, financial intelligence and legal capacity. Its role would be to identify evasion patterns, support Member State enforcement and recommend updates.

Closing loopholes is not only about punishment. It is about credibility. If fossil sanctions are widely evaded, aggressor states retain revenue and European policy loses force. Effective enforcement requires persistence, technical expertise and political will.

10.10 Avoid replacing Russian dependency with new strategic dependencies

Europe should avoid replacing Russian fossil fuel dependency with new strategic dependencies. The post-2022 shift away from Russian energy was necessary, but diversification must not become a transfer of vulnerability from one supplier, route or technology to another.[641]

This principle applies to several areas:

1. LNG diversification should avoid overdependence on a small number of suppliers. The United States, Qatar, Norway, Algeria and others may be important partners, but Europe should avoid new long-term dependencies that constrain policy or delay decarbonisation.
2. Oil diversification should consider route risk. Supplies moving through Hormuz, Bab el-Mandeb or other chokepoints carry strategic exposure even if the supplier is friendly.[642]
3. Critical minerals should not become a new concentrated dependency. Europe should avoid relying excessively on one country for lithium processing, rare earths, graphite, battery components or solar manufacturing.

[640] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; European Commission, 'Frequently Asked Questions on EU Restrictive Measures against Russia', European Commission, accessed 4 June 2026.

[641] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

[642] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022).

4. Clean technology supply chains should be diversified. Solar panels, batteries, inverters, transformers and power electronics are strategic assets. Excessive dependence on any single external actor creates risk.[643]
5. Digital energy systems should be secure. Smart grids, meters, control systems and software should be assessed for cyber and ownership risks.
6. Hydrogen and future fuels should be evaluated carefully. Europe should not build new import dependencies on hydrogen or derivatives without assessing supplier risk, infrastructure cost and strategic substitutability.

The lesson from Russian gas is not that one particular supplier was uniquely dangerous. The broader lesson is that strategic dependence becomes dangerous when it is concentrated, hard to replace and controlled by actors able to exploit it. This logic applies across the energy transition.[644]

Policy should therefore adopt a dependency-risk framework. For each critical energy input or technology, Europe should assess supplier concentration, political risk, substitutability, storage, recycling potential, infrastructure dependence, ownership risk and compatibility with long-term objectives.

The EU should also avoid overcorrecting into autarky. Complete self-sufficiency is neither realistic nor desirable. Europe will need trade, partnerships and imports. The goal is resilient interdependence: diversified, transparent, politically manageable and backed by domestic or allied alternatives.[645]

Avoiding new dependencies requires foresight. Dependencies are often built gradually through cheap supply, infrastructure investment and commercial convenience. By the time they become visible as security risks, they are expensive to unwind. Europe should apply the lessons of 2022 before new vulnerabilities harden.

10.11 Support producer-country diversification and transition finance

The transition away from fossil fuels will affect producer countries that depend on oil, gas or coal revenue. Some may adapt through diversification, sovereign wealth management and industrial reform. Others may face fiscal stress, unemployment, social tension and political instability. Europe has a strategic interest in supporting orderly diversification among partner countries, particularly in its neighbourhood and in fragile regions.[646]

Producer-country vulnerability matters for several reasons:

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[643] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024).

[644] European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023.

[645] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Global Gateway*, JOIN(2021) 30 final, Brussels, 1 December 2021; International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026.

[646] International Monetary Fund, Economic Diversification in Oil-Exporting Arab Countries (Washington, DC: IMF, 2016); World Bank, Diversified Development: Making the Most of Natural Resources in Eurasia (Washington, DC: World Bank, 2014).

1. Fiscal dependence on fossil exports can create instability when revenues fall. Governments may struggle to fund salaries, subsidies, public services and security forces.
2. Declining revenue can intensify elite competition. If rents shrink, political groups may fight over the remaining income.
3. Weak diversification can create unemployment and social discontent.
4. Producer states may resist global climate policy if they see it as a threat to regime survival.
5. Instability in producer regions can affect migration, conflict, terrorism, organised crime and European energy interests.[647]

The EU should therefore integrate transition finance into foreign and development policy. Support should be targeted at countries where fossil revenue decline could create instability and where credible reform partnerships are possible.

Policy tools could include technical assistance for fiscal diversification; support for renewable energy and grid investment; development finance for non-fossil industries; debt instruments linked to transition and governance reforms; support for vocational training and regional development; transparent revenue-management systems; anti-corruption reforms in national oil and gas sectors; assistance in reducing fossil fuel subsidies while protecting vulnerable households; partnerships for critical minerals with environmental and governance standards; and support for methane reduction and flaring elimination during transition.[648]

The EU should avoid a purely extractive approach. It should not seek minerals, hydrogen or renewable resources from partner countries in ways that reproduce old dependency patterns. Partnerships should support local value addition, employment, environmental standards and accountable institutions.[649]

Transition finance should also distinguish between countries. Gulf producers with large sovereign wealth funds have different needs from fragile African or Central Asian states. Coal-dependent regions in EU candidate countries have different needs from oil-exporting states in the Middle East. Policy must be tailored.

Supporting producer-country diversification is not charity. It is conflict prevention. A disorderly fossil fuel decline could create instability in regions important to Europe. A managed transition can reduce the risks associated with rent collapse, youth unemployment, illicit economies and political repression.

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[647] World Bank, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026); Stockholm International Peace Research Institute, *Environment of Peace: Security in a New Era of Risk* (Stockholm: SIPRI, 2022).

[648] World Bank, *Managing Coal Mine Closure: Achieving a Just Transition for All* (Washington, DC: World Bank, 2018); International Energy Agency, *Global Methane Tracker 2025* (Paris: IEA, 2025).

[649] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Global Gateway*, JOIN(2021) 30 final, Brussels, 1 December 2021; OECD, *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, 3rd edn. (Paris: OECD Publishing, 2016).

10.12 Develop a European critical minerals security strategy

A European critical minerals security strategy should be treated as part of energy security. The transition to renewables, batteries, electric vehicles, grids and digital energy systems depends on minerals and processed materials. If these supply chains are concentrated, opaque or controlled by strategic competitors, Europe may reduce fossil vulnerability while creating new exposure.[650]

The strategy should build on the Critical Raw Materials Act but go further in implementation. It should include mining, processing, recycling, substitution, stockpiling, trade partnerships, environmental standards and industrial capacity:[651]

1. Europe should diversify sourcing. No strategic material should depend excessively on one supplier. Partnerships with reliable countries should be deepened, including through long-term offtake agreements, investment guarantees and infrastructure support.
2. Processing capacity should be expanded in Europe and allied countries. Mining diversification is insufficient if refining remains concentrated elsewhere.
3. Recycling should be scaled. Batteries, magnets, copper, aluminium, solar panels and electronics should be recovered and processed domestically where feasible. Recycling reduces long-term dependency and environmental impact.[652]
4. Substitution should be supported. Research into alternative battery chemistries, low-rare-earth motors, sodium-ion technologies, recyclable designs and material efficiency should receive strategic funding.
5. Strategic reserves should be considered for minerals critical to defence and energy systems. Stockpiling cannot cover all needs, but it can cushion short-term disruption.
6. Environmental and labour standards should be enforced. Europe should not reduce fossil dependence by relying on destructive or abusive mineral extraction elsewhere.
7. Supply-chain transparency should be improved. Companies should identify origins, processing locations, ownership structures and environmental, social and governance risks for strategic materials.[653]
8. Permitting for responsible domestic extraction and processing should be improved. Environmental standards should remain high, but decision-making should be timely and predictable.
9. Mineral strategy should be linked to industrial policy. Processing, battery production, magnet manufacturing, grid equipment and recycling should form part of a coherent value chain.

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[650] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023).

[651] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[652] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); European Commission, A New Circular Economy Action Plan: For a Cleaner and More Competitive Europe, COM(2020) 98 final, Brussels, 11 March 2020.

[653] OECD, OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, 3rd edn. (Paris: OECD Publishing, 2016); International Energy Agency, Sustainable and Responsible Critical Mineral Supply Chains: Guidance for Policy Makers (Paris: IEA, 2023).

10. Minerals should be included in security assessments. Export restrictions, political instability, conflict, sanctions and market concentration should be monitored.[654]

Critical minerals differ from fossil fuels because they are not burned. They can be recycled and substituted over time. This gives Europe an opportunity to build a more resilient system than the fossil fuel system it seeks to leave behind. But that resilience will not happen automatically. It requires policy.

10.13 Expand recycling, domestic processing and strategic reserves

Recycling, domestic processing and strategic reserves are practical tools for reducing dependency in the energy transition.

Recycling should be expanded across batteries, wind turbines, solar panels, grid equipment, electronics and industrial metals. The EU should set clear collection, recovery and recycled-content requirements where feasible. Product design should support disassembly and material recovery. Waste export rules should prevent loss of valuable materials where domestic recycling capacity exists.[655]

Battery recycling is particularly important. As electric vehicles and stationary storage expand, large volumes of batteries will reach end of life. Early investment in recycling capacity will reduce future dependence on primary lithium, cobalt, nickel and other materials. It will also create industrial value in Europe.[656]

Rare earth magnet recycling should also be prioritised. Magnets are relevant to wind turbines, electric vehicles and defence technologies. Recovering rare earths from end-of-life products can reduce dependence on concentrated processing.

Copper recycling is essential for grids and electrification. Demand for copper will rise substantially as electricity networks expand. Recycling can reduce pressure on mining and improve supply security.[657]

Domestic processing is equally important. Europe may not have enough domestic mineral resources to meet all needs, but it can build processing and refining capacity for materials sourced from partners. Processing is often where strategic leverage lies. If Europe imports raw materials but depends on one external actor for refining, vulnerability remains.[658]

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[654] International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication on a European Economic Security Strategy, JOIN(2023) 20 final, Brussels, 20 June 2023.

[655] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); European Commission, A New Circular Economy Action Plan: For a Cleaner and More Competitive Europe, COM(2020) 98 final, Brussels, 11 March 2020.

[656] International Energy Agency, Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining (Paris: IEA, 2024); International Energy Agency, Batteries and Secure Energy Transitions (Paris: IEA, 2024).

[657] International Energy Agency, Electricity Grids and Secure Energy Transitions (Paris: IEA, 2023); International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025).

[658]International Energy Agency, Global Critical Minerals Outlook 2025 (Paris: IEA, 2025); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable

Strategic reserves should be considered for selected materials. These should not be broad stockpiles of every mineral, but targeted reserves for materials critical to defence, grids, batteries and emergency repair. Reserve policy should be co-ordinated with industry to avoid distorting markets unnecessarily.

Strategic reserves should also include equipment, not only raw materials. Large transformers, high-voltage cables, substations, grid components and critical spare parts may be more important during crisis than raw mineral stocks. Europe should assess which components are difficult to replace quickly and develop shared reserves or mutual assistance mechanisms.[659]

These measures require financing and governance. Recycling plants, refineries and stockpiles are capital-intensive. Public-private partnerships may be needed. Oversight is essential to avoid waste and corruption.

The objective is not self-sufficiency. It is resilience. Recycling, processing and reserves give Europe time and flexibility during supply disruption. They reduce dependence on single suppliers and improve bargaining power.

10.14 Explore a fossil fuel phase-down or non-proliferation framework

The EU and its partners should explore diplomatic frameworks for fossil fuel phase-down or fossil fuel non-proliferation. Such initiatives face major political obstacles, especially from producer states and economies still dependent on fossil fuels. However, the security case for reducing fossil fuel dependence strengthens the argument for international mechanisms that address production as well as consumption.[660]

Current climate policy has often focused on emissions, demand and national targets. Fossil fuel production has been more politically difficult. Producer states are reluctant to restrict future output, especially where public finances depend on hydrocarbons. Importing states may also avoid production limits if they fear supply shortages. Yet the security analysis in this White Paper suggests that continued fossil fuel dependence also sustains coercion, war finance and chokepoint vulnerability.[661]

A phase-down framework should be realistic. It should not assume immediate universal agreement. It could begin with like-minded states, transparency, reporting, subsidy reform,

supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, Official Journal of the European Union, L, 2024/1252, 3 May 2024.

[659] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; NATO, ‘Resilience, Civil Preparedness and Article 3’, NATO, Brussels, accessed 4 June 2026.

[660] Stockholm Environment Institute, Climate Analytics, E3G, International Institute for Sustainable Development and United Nations Environment Programme, *The Production Gap Report 2025* (Stockholm: SEI, 2025).

[661] United Nations Environment Programme, *Emissions Gap Report 2025* (Nairobi: UNEP, 2025); Stockholm Environment Institute, Climate Analytics, E3G, International Institute for Sustainable Development and United Nations Environment Programme, *The Production Gap Report 2025* (Stockholm: SEI, 2025).

methane reduction, restrictions on public finance for new fossil infrastructure, and support for economic diversification.[662]

A fossil fuel non-proliferation approach could include transparency on planned fossil fuel production; commitments to avoid new high-risk fossil infrastructure incompatible with climate and security goals; phase-down pathways for coal, oil and gas differentiated by national circumstances; support for producer-country diversification; finance for affected workers and regions; methane and flaring reduction obligations; restrictions on public finance for new fossil projects; rules against using energy supply as coercive leverage; and integration of fossil revenue risk into conflict-prevention frameworks.

The term "non-proliferation" may be politically sensitive because fossil fuels are not weapons in the legal sense. However, the analogy is useful if applied carefully: the objective is to reduce the spread and strategic power of a system that creates global risk. A more acceptable diplomatic term may be "managed fossil fuel phase-down framework".

The EU should not present this as a moral campaign detached from security realities. It should frame the issue in terms of resilience, market stability, conflict prevention and economic transition. Producer states must be offered credible pathways, not only restrictions.[663]

Such a framework would be difficult. Major producers may refuse. Importers may fear price shocks. Developing countries may object to constraints imposed by wealthy states that benefited from fossil industrialisation. These concerns are real. Any framework must include fairness, finance and differentiated responsibilities.

The purpose of exploring the framework is not to expect quick success. It is to begin aligning climate policy with the security reality that fossil fuels finance and enable coercive power. Over time, diplomatic norms can shape investment, public finance and strategic planning.

10.15 Build energy resilience into enlargement, neighbourhood and development policy

Energy resilience should be integrated into EU enlargement, neighbourhood and development policy. Candidate countries, neighbouring states and partner regions often face high energy vulnerability, ageing infrastructure, fossil dependence, weak regulation, corruption, low efficiency and exposure to external pressure. Supporting their resilience strengthens European security.[664]

In enlargement policy, energy reforms should not be treated only as market alignment or climate compliance. They should be part of security integration. Candidate countries should be supported in reducing dependence on hostile suppliers, improving grids, expanding

[662] International Energy Agency, Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach — 2023 Update (Paris: IEA, 2023); OECD, OECD Inventory of Support Measures for Fossil Fuels 2025 (Paris: OECD Publishing, 2025).

[663] World Bank, Managing Coal Mine Closure: Achieving a Just Transition for All (Washington, DC: World Bank, 2018); International Monetary Fund, Economic Diversification in Oil-Exporting Arab Countries (Washington, DC: IMF, 2016).

[664] European Commission, *2025 Communication on EU Enlargement Policy*, COM(2025), Brussels, 2025; Energy Community Secretariat, *Annual Implementation Report 2025* (Vienna: Energy Community Secretariat, 2025).

renewables, strengthening regulators, protecting infrastructure and applying EU energy rules.[665]

Ukraine is the most urgent case. Its reconstruction should build a more resilient energy system, not simply restore pre-war vulnerabilities. This should include decentralised generation, grid hardening, interconnectors, storage, energy efficiency, environmental remediation and protection of critical infrastructure. Ukraine's integration with European energy markets should be treated as a strategic project.[666]

The Western Balkans also require attention. Some countries remain dependent on coal, imported gas or vulnerable electricity systems. Transition support should include just transition finance, grid investment, renewables, efficiency and reduction of external leverage.[667]

In the Eastern Partnership region, energy dependence intersects with Russian pressure, infrastructure vulnerability and governance challenges. Diversification, interconnection and renewable deployment can strengthen sovereignty.

In the Southern Neighbourhood, energy policy intersects with migration, development, climate stress, water scarcity, fossil export dependence and renewable potential. The EU should support partnerships that promote local benefit, not only European energy imports.[668]

Development policy should support energy access through resilient, decentralised systems where appropriate. Microgrids, solar, storage and efficient appliances can reduce dependence on imported diesel in fragile regions. This can support hospitals, schools, water systems and local economies.

Energy-resilience policy should also address fossil fuel subsidies. Subsidy reform is politically sensitive because fuel prices affect households. Reform should be gradual, transparent and accompanied by targeted social protection. Poorly designed subsidy removal can trigger unrest; well-designed reform can reduce fiscal pressure and inefficient consumption.[669]

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[665] Energy Community Secretariat, *Annual Implementation Report 2025* (Vienna: Energy Community Secretariat, 2025); European Commission, *2025 Communication on EU Enlargement Policy*, COM(2025), Brussels, 2025.

[666] World Bank, Government of Ukraine, European Union and United Nations, *Ukraine Rapid Damage and Needs Assessment 4: February 2022 – December 2025* (Washington, DC: World Bank, 2026); European Commission, 'Ukraine Recovery and Reconstruction', European Commission, accessed 4 June 2026.

[667] Energy Community Secretariat, *Annual Implementation Report 2025* (Vienna: Energy Community Secretariat, 2025); World Bank, *Managing Coal Mine Closure: Achieving a Just Transition for All* (Washington, DC: World Bank, 2018).

[668] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Global Gateway*, JOIN(2021) 30 final, Brussels, 1 December 2021; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a Renewed Partnership with the Southern Neighbourhood: A New Agenda for the Mediterranean*, JOIN(2021) 2 final, Brussels, 9 February 2021.

[669] International Monetary Fund, Energy Subsidy Reform: Lessons and Implications (Washington, DC: IMF, 2013); World Bank, Subsidy Reforms and Social Protection: Lessons from Country Experiences (Washington, DC: World Bank, 2023).

The EU should also integrate environmental remediation into development assistance. Regions affected by oil spills, illegal refining, coal pollution or damaged energy infrastructure need support for clean-up and monitoring.

Energy resilience in external policy should be guided by several principles: reduce coercive dependence; support local ownership and benefits; avoid creating new extractive relationships; link infrastructure finance to governance and transparency; support grids and efficiency, not only generation; include environmental and social safeguards; and align energy policy with conflict prevention.[670]

The EU's external credibility will depend on whether it applies the same logic abroad that it applies at home. If fossil fuel dependence is a security vulnerability for Europe, it is also a vulnerability for partner countries. Helping them reduce that vulnerability is part of a wider strategy of stability and resilience.

Institution	Main role	Priority actions	Time horizon	Strategic rationale
European Commission	Policy design and co-ordination	Integrate energy security, transition, sanctions and critical-minerals strategy	Short to medium term	Reduces structural dependence and aligns energy and security policy.
Council / Member States	Implementation and national resilience	Demand reduction, electrification, storage, contingency planning, infrastructure protection	Immediate to long term	Strengthens sovereignty and crisis preparedness.
European Parliament	Legislative oversight	Support regulatory frameworks on transition, sanctions enforcement and strategic infrastructure	Medium term	Provides democratic legitimacy and scrutiny.
NATO	Security and resilience co-operation	Protect critical infrastructure, monitor undersea assets, address hybrid threats	Immediate to medium term	Reduces sabotage and route-risk exposure.
International financial institutions	Finance and economic support	Support diversification, transition finance and resilience investment	Medium to long term	Limits instability in partner and producer states.
Partner countries	External co-operation	Diversify economies, improve governance, expand clean-energy resilience	Long term	Reduces future dependence and conflict vulnerability.

Table 11. Policy recommendations by institution

[670] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication on a New Outlook on the Climate and Security Nexus, JOIN(2023) 19 final, Brussels, 28 June 2023; World Bank, Natural Resources and Violent Conflict: Options and Actions (Washington, DC: World Bank, 2003).

Concluding policy judgement

The policy recommendations in this chapter form a single strategic programme. Fossil fuel dependence should be treated as a security vulnerability. Energy transition should be integrated into defence, foreign policy and resilience planning. Demand reduction, electrification, renewables, storage and grids should be accelerated. Critical infrastructure must be protected. Fossil revenues that finance aggression should be targeted. Sanctions loopholes should be closed. New dependencies must be avoided. Producer countries should be supported in diversification. Critical minerals require a full security strategy. Recycling, processing and reserves should be expanded. A diplomatic framework for fossil fuel phase-down should be explored. Energy resilience should be built into enlargement, neighbourhood and development policy.

The recommendations are mutually reinforcing. Demand reduction increases sanctions flexibility. Renewable deployment reduces import exposure. Grid resilience makes electrification secure. Infrastructure protection reduces hybrid vulnerability. Critical minerals strategy prevents new dependencies. Producer-country diversification reduces transition-related instability. EU-NATO co-operation strengthens deterrence and response.

The central policy message is that Europe should not approach energy security as a search for safer fossil fuel suppliers alone. Safer suppliers are necessary during transition, but the deeper objective is to reduce the strategic weight of fossil fuels themselves. The less Europe depends on oil, gas and coal, the less vulnerable it is to coercion, chokepoints, fossil-funded aggression and environmental damage.

Energy transition should therefore be understood as a strategic security project: a shift from exposed dependence to resilient autonomy.

Chapter 11

Conclusion: From Energy Dependence to Strategic Resilience

11.1 Fossil fuels as environmental and security liabilities

The central argument of this White Paper is that fossil fuel dependence should be treated as a security vulnerability as well as an environmental and climate problem. Oil, gas and coal have powered industrial development, military mobility, economic growth and modern state capacity. They have also created repeated patterns of coercion, conflict finance, strategic exposure, infrastructure vulnerability and environmental harm.[671]

The argument is not that fossil fuels are the sole cause of war. Such a claim would be historically inaccurate and analytically weak. Armed conflicts are driven by many causes: territorial ambition, regime survival, ideology, ethnic and sectarian mobilisation, imperial claims, state collapse, external intervention, economic grievance and security dilemmas.

[671] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

Fossil fuels rarely explain conflict by themselves. Their security significance lies in the way they shape the conditions under which conflict occurs, continues and spreads.[672]

Fossil fuels matter because they are geographically concentrated, economically valuable, traded through vulnerable routes, dependent on fixed infrastructure and essential to industrial societies. These characteristics allow them to become instruments of power. A state controlling production, transit or pricing may gain leverage over importers. A government receiving large hydrocarbon revenues may finance military expansion, repression or patronage. An armed group controlling oilfields, fuel depots or smuggling routes may sustain operations. A local disruption in a maritime chokepoint may affect global prices. A damaged refinery, pipeline or power station may produce environmental damage lasting far beyond the immediate conflict.[673]

The environmental dimension is inseparable from the security dimension. Oil spills, methane leakage, gas flaring, coal pollution, refinery strikes, burning wells and damaged fuel depots affect public health, livelihoods, state legitimacy and reconstruction costs. Environmental damage is not merely an after-effect of war. In many cases, it becomes part of the conflict environment itself. It can deepen grievances, weaken local economies, obstruct recovery and increase the burden on fragile institutions.[674]

The cases examined in this White Paper support this conclusion. The 1973–74 oil embargo demonstrated deliberate supply coercion. Iraq's invasion of Kuwait showed how oil wealth, debt, production disputes and regional power could interact in conflict. The burning of Kuwaiti oil wells showed the environmental consequences of fossil infrastructure destruction. ISIS demonstrated how captured oil assets can finance non-state violence. Libya showed how control of oil terminals can become a bargaining tool in a fragmented state. Sudan and South Sudan showed the vulnerability of extreme oil dependence and transit exposure. The Niger Delta illustrated the connection between extraction, pollution, illicit economies and local insecurity. Russia's war against Ukraine showed fossil revenue, energy coercion, infrastructure targeting and European import dependence in the same strategic crisis.[675]

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[672] Emily Meierding, *The Oil Wars Myth: Petroleum and the Causes of International Conflict* (Ithaca, NY: Cornell University Press, 2020); Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005).

[673] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); Jeff D. Colgan, *Petro-Aggression: When Oil Causes War* (Cambridge: Cambridge University Press, 2013); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025).

[674] United Nations Environment Programme, Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law (Nairobi: UNEP, 2009); International Committee of the Red Cross, Guidelines on the Protection of the Natural Environment in Armed Conflict (Geneva: ICRC, 2020).

[675] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17, Geneva, 9 December 2004; United Nations Compensation Commission, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10, Geneva, 30 June 2005; Financial Action Task Force, Financing of the Terrorist Organisation Islamic State in Iraq and the Levant (ISIL) (Paris: FATF, February 2015); Centre for Research on Energy and Clean Air, Financing Putin's War: Fossil Fuel Exports from Russia since the Invasion of Ukraine (Helsinki: CREA, 2022–2026).

These cases differ. They do not prove a single universal theory. They do, however, demonstrate recurring mechanisms. Fossil fuels can be direct strategic objectives, enabling sources of finance, instruments of coercion, conflict multipliers and environmental hazards. That pattern is sufficient to justify a new policy frame.

The conclusion is therefore straightforward: fossil fuels are not only fuels. They are systems of revenue, leverage, infrastructure and risk. Reducing dependence on them is not only an environmental objective. It is a strategic-security objective.

11.2 Coercion, conflict finance and infrastructure exposure

Three security risks run through this White Paper: coercion, conflict finance and infrastructure exposure.

The first risk is coercion. Fossil fuels can be weaponised when a supplier, transit state, cartel, armed group or infrastructure owner uses energy access to influence political behaviour. This can be done through supply cuts, threatened disruption, selective pricing, contract manipulation, control of storage, pipeline politics, port disruption or maritime threats. Energy coercion works best when the target has limited alternatives and high dependence.[676]

Russia's use of gas against Europe is the clearest recent European example. The reduction and disruption of gas flows after the full-scale invasion of Ukraine exposed the strategic consequences of pipeline dependence. It also showed that interdependence does not automatically restrain aggression. A supplier may accept economic losses if it sees political or military advantage. The lesson for Europe is that commercial relationships with strategic adversaries cannot be assessed only through price and delivery history.[677]

The second risk is conflict finance. Fossil fuel revenues can sustain military expenditure, internal security services, proxy networks, sanctions evasion and armed-group activity. Russia's fossil fuel exports during the war against Ukraine, ISIS oil smuggling in Iraq and Syria, militia leverage over Libyan oil infrastructure, and the fiscal dependence of South Sudan all show different forms of fossil-enabled conflict capacity. Fossil fuels may not start the conflict, but they can help keep it going.[678]

This matters for sanctions. If fossil revenues finance aggression, sanctions and price restrictions should target those revenues. However, sanctions are constrained when importers remain dependent on the same fuels. A country that needs imported oil and gas

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[676] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy*, vol. 75, 2014, pp. 415–421.

[677] European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022; European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022.

[678] CREA, *Financing Putin's War*; FATF, *Financing of ISIL*; UNSC, *Final Report of the Panel of Experts on Libya*; World Bank, *South Sudan Economic Monitor*.

has less freedom to restrict the revenue of hostile exporters. Energy transition therefore strengthens sanctions policy by reducing the cost of action.[679]

The third risk is infrastructure exposure. Fossil fuel systems depend on pipelines, refineries, ports, LNG terminals, tankers, storage sites and maritime chokepoints. These assets are vulnerable to attack, sabotage, accident, cyber disruption, mining, drones and coercive control. The Strait of Hormuz, Bab el-Mandeb, the Suez Canal, the Turkish Straits, the Strait of Malacca, Druzhba, Nord Stream and Black Sea energy routes show how geography can become strategic vulnerability.[680]

Infrastructure exposure also produces cascading effects. A pipeline cut can raise gas prices. Gas prices can raise electricity prices. Electricity prices can affect industry, households, inflation and public finances. A tanker-route disruption can raise oil prices. Higher oil prices can affect transport, agriculture, military logistics and food prices. A refinery strike can produce product shortages even where crude is available. Energy infrastructure is therefore not a narrow technical issue. It is part of economic and political stability.[681]

These three risks reinforce each other. A state using energy coercion may also be funded by fossil revenues. An armed group may finance itself through oil smuggling and attack infrastructure. A chokepoint crisis may raise prices and increase revenue for producer states. A pipeline dependency may weaken the willingness of importers to impose sanctions. A refinery attack may cause pollution, economic disruption and political pressure simultaneously.

The policy response must therefore be integrated. Energy security cannot be separated from defence, sanctions, industrial policy, environmental protection and foreign policy. A narrow search for alternative fossil suppliers is insufficient. The strategic task is to reduce the leverage that fossil fuels create.

11.3 The strategic meaning of energy transition

Energy transition is often described as a technological shift: replacing coal plants with renewables, gas boilers with heat pumps, petrol vehicles with electric vehicles, and fossil electricity with low-carbon power. This description is accurate but incomplete. The transition also has strategic meaning. It changes the distribution of power, dependence and vulnerability.[682]

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[679] European Council, 'EU Sanctions against Russia Explained', European Council / Council of the European Union, accessed 4 June 2026; G7, 'G7 Agrees Oil Price Cap: Joint Statement', 2 September 2022; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

[680] U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); NATO, 'Statement by the North Atlantic Council on the Damage to Gas Pipelines', Brussels, 29 September 2022.

[681] European Central Bank, *Economic Bulletin*, Issue 4/2022, Frankfurt am Main: ECB, 2022; European Commission, Directorate-General for Economic and Financial Affairs, *European Economic Forecast: Spring 2023*, Institutional Paper 200 (Luxembourg: Publications Office of the European Union, 2023).

[682] International Renewable Energy Agency, *Geopolitics of the Energy Transition: Critical Materials* (Abu Dhabi: IRENA, 2023); International Energy Agency, *World Energy Outlook 2024* (Paris: IEA, 2024).

A fossil fuel system gives strategic influence to those who control reserves, production, pipelines, tanker routes and pricing. It rewards states with large hydrocarbon endowments, even where governance is weak or foreign policy is aggressive. It exposes importers to supply disruption and price volatility. It requires continuous fuel flows. It concentrates risk in infrastructure and chokepoints.[683]

A renewable and electrified system changes that structure. Wind and solar do not require continuous imported fuel once installed. Efficiency reduces total energy demand. Electrification can reduce oil and gas use in transport, heating and industry. Storage and flexible demand can reduce dependence on gas-fired balancing. Distributed generation and microgrids can improve resilience. A state that produces more of its energy domestically from renewable sources is harder to pressure through fuel supply.[684]

This does not mean that the transition ends geopolitics. It shifts geopolitical competition towards critical minerals, processing, manufacturing, grids, digital systems, storage and industrial capacity. China's role in clean technology supply chains, concentration in mineral refining, cyber risks and grid vulnerability all demonstrate that the new system carries its own risks. Those risks should be taken seriously.[685]

The strategic case for transition is therefore comparative. Renewable systems are not risk-free, but they reduce several specific fossil fuel vulnerabilities. Critical minerals can be recycled; oil and gas cannot be burned twice. Mineral supply chains can be diversified and substituted over time; pipeline gas dependence can be difficult to escape quickly. Solar panels and wind turbines require upfront materials; fossil fuel plants require continuous fuel supply. An electrified system depends heavily on grids; a fossil system depends heavily on suppliers, shipping and chokepoints.[686]

The transition should therefore be designed as a security project. That means building resilient grids, storage, interconnectors, cyber protection, domestic and allied manufacturing, critical mineral recycling, diversified supply chains and public legitimacy. It also means avoiding new single-source dependencies. The failure of Europe's previous Russian gas policy should not be repeated in clean technology, minerals or future fuels.[687]

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[683] Michael L. Ross, The Oil Curse: How Petroleum Wealth Shapes the Development of Nations (Princeton, NJ: Princeton University Press, 2012); Jeff D. Colgan, Petro-Aggression: When Oil Causes War (Cambridge: Cambridge University Press, 2013); U.S. Energy Information Administration, World Oil Transit Chokepoints (Washington, DC: EIA, 2025).

[684] International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024); International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); International Energy Agency, *The Future of Heat Pumps* (Paris: IEA, 2022).

[685] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); International Energy Agency, *Energy Technology Perspectives 2024* (Paris: IEA, 2024); European Union Agency for Cybersecurity, *ENISA Threat Landscape: Energy Sector* (Athens: ENISA, 2023).

[686] International Energy Agency, *Recycling of Critical Minerals: Strategies to Scale Up Recycling and Urban Mining* (Paris: IEA, 2024); International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[687] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a European Economic Security Strategy*, JOIN(2023) 20 final, Brussels, 20 June 2023; Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

Energy transition also changes sanctions and foreign policy. A Europe less dependent on oil and gas can act with greater freedom against aggressor states. It can impose revenue restrictions with less domestic cost. It can resist supply threats more easily. It can support allies without fearing immediate energy blackmail. It can reduce the ability of fossil exporters to divide European policy. The strategic meaning of energy transition is therefore not only lower emissions. It is reduced coercibility.

11.4 A security framework for decarbonisation

Decarbonisation should be embedded in a security framework. This does not mean militarising climate policy. It means recognising that the same measures that reduce emissions can also strengthen resilience, sovereignty and conflict prevention when properly designed.[688]

A security framework for decarbonisation should rest on several principles:

1. Fossil fuel demand reduction should be prioritised. The most secure fossil fuel import is the one that is no longer needed. Efficiency, electrification, public transport, industrial modernisation and heat-pump deployment reduce exposure to external suppliers.[689]
2. Renewable deployment should be treated as strategic infrastructure. Wind, solar and other low-carbon sources reduce fuel-import dependence, but they must be linked to storage, grids and flexibility.
3. Grids should become central to security planning. Electrification shifts vulnerability from fuel flows to networks. Transmission, distribution, interconnectors, substations, transformers and digital control systems should be protected and expanded.[690]
4. Critical infrastructure protection should cover both old and new systems. Pipelines, LNG terminals and refineries remain relevant during transition. Offshore wind, battery storage, interconnectors and undersea cables become more important over time.[691]
5. Sanctions policy should be linked to demand reduction. Reducing fossil fuel use increases the ability to target revenues that finance aggression.
6. Critical minerals policy should be fully integrated into energy security. Europe should diversify sourcing, build processing capacity, expand recycling, support alternative chemistries and maintain strategic reserves where necessary.[692]

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[688] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023; NATO, *Climate Change and Security Action Plan* (Brussels: NATO, 2021).

[689] International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); European Commission, *EU Save Energy*, COM(2022) 240 final, Brussels, 18 May 2022.

[690] European Commission, *Grids, the Missing Link: An EU Action Plan for Grids*, COM(2023) 757 final, Brussels, 28 November 2023; International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023).

[691] NATO, 'Energy Security', NATO, Brussels, accessed 4 June 2026; European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on the Update of the EU Maritime Security Strategy and Its Action Plan: An Enhanced EU Maritime Security Strategy for Evolving Maritime Threats*, JOIN(2023) 8 final, Brussels, 10 March 2023.

[692] International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable

7. Industrial policy should support strategic autonomy. Europe needs sufficient capacity to manufacture, maintain and repair core energy technologies.
8. Transition policy should include social legitimacy. Communities affected by renewable infrastructure, grid expansion, industrial change or mine development should be treated as stakeholders. A transition that lacks public consent will stall, and a stalled transition prolongs fossil vulnerability.[693]
9. Environmental remediation should be included in conflict recovery. Oil spills, refinery damage, methane releases and destroyed energy infrastructure should be assessed, documented and repaired as part of reconstruction.
10. External policy should support producer-country diversification. Some fossil exporters may become unstable as global demand changes. Supporting economic diversification is part of conflict prevention.[694]

Such a framework would align EU climate, energy, defence, industrial and foreign policy. It would also support NATO resilience objectives by reducing the vulnerability of civilian energy systems on which defence capability depends.

A security framework for decarbonisation should also be honest about trade-offs. Some fossil fuels will remain necessary during transition. Emergency LNG infrastructure may be required. Certain industries will need time to decarbonise. Critical minerals will create environmental and social challenges. Grids will take years to build. Public resistance may slow projects. These realities do not weaken the transition case. They show that transition must be planned, financed and governed seriously.

The alternative is not stability. Continuing fossil dependence means continued exposure to coercion, price shocks, war finance, chokepoints and environmental damage. Decarbonisation with security planning is difficult; fossil dependence without security planning is dangerous.

11.5 Reducing the power of energy blackmail

Energy blackmail works when dependence is high and alternatives are limited. A supplier can threaten to cut gas, restrict oil, raise prices, delay deliveries, manipulate contracts, withhold storage or exploit infrastructure dependency. The target may then face economic harm, public pressure and policy constraint.[695]

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supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020, *Official Journal of the European Union*, L, 2024/1252, 3 May 2024.

[693] European Commission, 'The Just Transition Mechanism: Making Sure No One Is Left Behind', European Commission, accessed 4 June 2026; European Commission, *Guidance to Member States on Good Practices to Speed Up Permit-Granting Procedures for Renewable Energy Projects and on Facilitating Power Purchase Agreements*, SWD(2022) 149 final, Brussels, 18 May 2022.

[694] International Monetary Fund, *Economic Diversification in Oil-Exporting Arab Countries* (Washington, DC: IMF, 2016); World Bank, *Diversified Development: Making the Most of Natural Resources in Eurasia* (Washington, DC: World Bank, 2014).

[695] International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

The best way to reduce energy blackmail is to reduce the value of the threat. This requires both short-term resilience and long-term transformation.

Short-term resilience includes storage, diversified suppliers, emergency reserves, interconnectors, LNG capacity where necessary, protected infrastructure and crisis protocols. These measures help states absorb shocks. They are necessary because Europe cannot eliminate fossil fuel use immediately.[696]

Long-term transformation means reducing fossil demand. A Europe that uses less gas for heating, less oil for transport and less coal for power is harder to blackmail. A Europe with more domestic renewable electricity, stronger grids and flexible demand is less exposed to external fuel threats. A Europe with diversified critical mineral and clean technology supply chains is less likely to reproduce dependency in another form.[697]

Energy blackmail also depends on political division. A supplier may target vulnerable states to divide alliances. EU solidarity mechanisms are therefore essential. A Member State facing supply pressure should not be left alone if infrastructure and resources allow support. Common planning, shared storage objectives, interconnectors and transparent communication strengthen collective resilience.[698]

Public communication is also important. Energy coercion often aims to create fear. If citizens believe that support for Ukraine, sanctions or foreign-policy decisions will make energy unaffordable, public pressure may increase. Governments should explain clearly why dependence is dangerous, how resilience measures work, and how households and industry will be protected.

Reducing energy blackmail also requires action against foreign influence. Fossil fuel exporters may support political networks, media narratives, lobbying or disinformation that defend dependency. Transparency in political finance, lobbying and strategic infrastructure ownership is therefore part of energy security.

Sanctions enforcement is another element. If an aggressor can continue earning large fossil revenues through loopholes, it may retain the capacity to wage war and apply pressure. Closing circumvention channels reduces the financial base of coercion.[699]

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[696] International Energy Agency, 'Oil Security and Emergency Response', IEA, accessed 4 June 2026; Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

[697] International Energy Agency, *Renewables 2024: Analysis and Forecast to 2030* (Paris: IEA, 2024); International Energy Agency, *Energy Efficiency 2025* (Paris: IEA, 2025); International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025).

[698] Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010, *Official Journal of the European Union*, L 280, 28 October 2017, pp. 1–56; Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage, *Official Journal of the European Union*, L 173, 30 June 2022, pp. 17–33.

[699] Kyiv School of Economics Institute, *Russian Oil Tracker*, accessed 4 June 2026; Centre for Research on Energy and Clean Air, *Russian Fossil Fuel Tracker*, accessed 4 June 2026; United States Department of the Treasury, *Price Cap Coalition Guidance on Russian Oil*, Washington, DC, accessed 4 June 2026.

The concept of energy blackmail should not be used loosely. Not every price increase or supply dispute is blackmail. The term should be reserved for cases where energy is deliberately used to force political behaviour. But the existence of such cases is well established. The 1973–74 oil embargo and Russia's gas coercion against Europe show that energy blackmail is a real feature of international politics.[700]

The policy objective should be to make it less effective. Europe cannot prevent all attempts at coercion, but it can reduce vulnerability. A resilient energy system is one that can say no.

11.6 Final policy message

This White Paper has argued that fossil fuel dependence creates strategic vulnerability through five recurrent pathways:

1. Fossil fuels provide revenue that can finance aggression, repression, proxy networks, armed groups and sanctions evasion.
2. Fossil fuels can be used as instruments of coercion through supply cuts, price manipulation, contracts, pipelines, ports and chokepoints.
3. Fossil fuel systems concentrate risk in infrastructure and maritime routes that can be attacked, blocked, sabotaged or disrupted.
4. Fossil fuel extraction, transport and wartime destruction create environmental damage that can deepen instability and complicate recovery.
5. Fossil fuel dependence constrains the policy autonomy of importing states, especially when suppliers are hostile, authoritarian or strategically opposed.[701]

The European experience since 2022 has shown that these risks are not abstract. Dependence on Russian fossil fuels exposed Europe to coercion and helped finance the state waging war against Ukraine. Reducing that dependence was a strategic necessity. The adjustment also showed that change is possible. Europe cut Russian imports, diversified supply, reduced gas demand, increased storage, accelerated renewables and began to treat energy security as part of strategic resilience.[702]

Yet the lesson is not complete if Europe simply replaces Russian fossil fuels with other fossil fuels. Supplier diversification is necessary during transition, but it does not remove the deeper vulnerability. Oil and gas remain exposed to global prices, maritime chokepoints, infrastructure sabotage and producer-state leverage. LNG can reduce pipeline dependence,

[700] United States Department of State, Office of the Historian, 'Oil Embargo, 1973–1974', accessed 4 June 2026; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 2, Brussels, 2022; European Commission, Directorate-General for Energy, *Quarterly Report on European Gas Markets*, vol. 15, issue 3, Brussels, 2022.

[701] Philippe Le Billon, *Fuelling War: Natural Resources and Armed Conflicts* (London: Routledge, 2005); Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012); International Energy Agency, 'Energy Security', IEA, accessed 4 June 2026; United Nations Environment Programme, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (Nairobi: UNEP, 2009).

[702] European Commission, 'REPowerEU: Three Years On — Commission Takes Stock of Progress to Phase Out Russian Fossil Fuels', European Commission, Brussels, 2025; European Commission, *Roadmap towards Ending Russian Energy Imports*, Brussels, 6 May 2025.

but it introduces shipping and market exposure. Emergency fossil infrastructure may be needed, but it should not become permanent lock-in.[703]

The long-term security answer is to reduce the strategic importance of fossil fuels themselves. This means lower demand, greater efficiency, electrification, renewable generation, storage, interconnectors, resilient grids, protected infrastructure, sanctions enforcement and critical mineral strategy. It also means supporting partner countries through the transition, addressing environmental damage from conflict, and ensuring that new energy systems are not built around new coercive dependencies.[704]

The transition away from fossil fuels is therefore not only about replacing one technology with another. It is about changing the political economy of energy. It is about reducing the power of actors that can turn oil, gas and coal into revenue, leverage and weapons. It is about making economies less vulnerable to blockade, blackmail, sabotage and price shock. It is about ensuring that environmental policy, defence policy and foreign policy reinforce each other rather than operate in separate compartments.

The final policy line is this:

Europe should treat energy transition as a security transition. The objective is not only to cut emissions, but to reduce the capacity of states and armed groups to use oil, gas and coal as instruments of coercion, conflict finance and long-term instability.

[703] International Energy Agency, *Gas Market Report, Q4 2022* (Paris: IEA, 2022); U.S. Energy Information Administration, *World Oil Transit Chokepoints* (Washington, DC: EIA, 2025); European Court of Auditors, *Security of the Supply of Gas in the EU: EU Framework Helped Member States Respond to the Crisis, but Impact of Some Crisis-Response Measures Cannot Be Demonstrated*, Special Report 09/2024 (Luxembourg: Publications Office of the European Union, 2024).

[704] European Commission, *REPowerEU Plan*, COM(2022) 230 final, Brussels, 18 May 2022; International Energy Agency, *Electricity Grids and Secure Energy Transitions* (Paris: IEA, 2023); International Energy Agency, *Global Critical Minerals Outlook 2025* (Paris: IEA, 2025); European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *Joint Communication on a New Outlook on the Climate and Security Nexus*, JOIN(2023) 19 final, Brussels, 28 June 2023.

Annexes

Annex I

Methodology and Analytical Framework

I.1 Research design

This White Paper uses a qualitative policy-analysis methodology. It combines historical review, comparative case-study analysis, political-economy assessment, infrastructure-risk analysis and review of publicly available institutional data. The purpose is to examine how fossil fuel dependence can create, intensify or prolong security risks, rather than to advance a single-cause theory of war.

The paper approaches fossil energy as a system of strategic vulnerability. Oil, gas and coal are assessed not only as traded commodities, but as sources of revenue, instruments of leverage, targets of military action, components of critical infrastructure and causes of environmental damage. This approach allows the paper to examine the different ways in which fossil fuels interact with conflict, coercion and instability.

The analysis is structured around several recurring questions. First, how have fossil fuels affected strategic decision-making in selected conflicts and crises? Secondly, how have fossil revenues financed state or non-state armed activity? Thirdly, how have fossil fuel supplies, prices, routes and infrastructure been used as instruments of coercion? Fourthly, how do chokepoints and fixed infrastructure create systemic vulnerability? Fifthly, how can transition away from fossil fuels reduce some security risks while creating new dependencies linked to critical minerals, grids, storage and industrial supply chains?

The paper does not claim that fossil fuels are the sole or automatic cause of war. Such a claim would be too broad and would not reflect the historical record. Armed conflicts usually have multiple drivers, including territorial ambition, regime survival, ideology, ethnic mobilisation, economic grievance, institutional weakness, external intervention and security dilemmas. Fossil fuels are therefore treated as one factor within a wider conflict environment. In some cases they may be central to escalation; in others they act as enabling factors, instruments of coercion, conflict multipliers or environmental consequences.

This methodology is intended to avoid both overstatement and underestimation. It avoids overstatement by not treating every fossil fuel-related crisis as a resource war. It avoids underestimation by recognising that fossil fuels can be strategically significant even where they are not the original cause of violence.

I.2 Case-study selection

The case studies used in this White Paper are illustrative rather than exhaustive. They were selected because they demonstrate different pathways through which fossil fuels affect security. The selection includes state and non-state actors, historical and contemporary examples, European and non-European cases, maritime and pipeline vulnerabilities, and environmental consequences of fossil fuel extraction or wartime targeting.

The principal case studies include Russia's use of gas against Europe, fossil fuel revenues during Russia's war against Ukraine, the 1973–74 oil embargo, Iraq's invasion of Kuwait, the burning of Kuwaiti oil wells in 1991, ISIS oil smuggling in Iraq and Syria, Libya's oil-terminal competition, Sudan and South Sudan's oil-linked conflict dynamics, the Niger Delta, the Strait of Hormuz, Bab el-Mandeb and Red Sea shipping disruption, and Ukraine's energy infrastructure under attack.

These cases were chosen for four reasons:

1. They show different mechanisms. Russia's gas policy illustrates coercion and import dependence. ISIS oil smuggling illustrates non-state conflict finance. Libya illustrates the use of oil infrastructure as a bargaining tool in a fragmented state. The Niger Delta illustrates the relationship between extraction, pollution, grievance and insecurity. Hormuz and Bab el-Mandeb illustrate chokepoint exposure. Ukraine illustrates the interaction of fossil revenues, infrastructure targeting, environmental damage and European energy security.
2. The cases are supported by a reasonably strong evidence base. The paper relies on official sources, institutional data, sanctions documentation, energy statistics, academic literature, investigative reporting and international organisation assessments. Cases with weak evidence, disputed claims or limited public documentation are used cautiously or not treated as central examples.
3. The cases have policy relevance for European and allied audiences. The White Paper is global in evidence, but European in policy emphasis. Cases were therefore selected partly for their relevance to EU energy security, NATO resilience, sanctions policy, maritime security, critical infrastructure protection and the strategic implications of energy transition.
4. The cases cover different time periods. The historical material shows that fossil fuel security risks are not new. The contemporary cases show that these risks remain active in the current strategic environment.

The case-study approach has limits. It does not produce statistical proof that fossil fuels cause conflict. It does not claim that the selected examples represent every fossil fuel-related crisis. Its purpose is to identify recurring patterns and mechanisms that can inform policy.

I.3 Source categories

This White Paper relies on publicly available sources. These sources fall into six broad categories.

The first category is official institutional material. This includes publications by the International Energy Agency, the European Commission, Eurostat, NATO, the United Nations Environment Programme, the World Bank, the International Monetary Fund, the Stockholm International Peace Research Institute, the Financial Action Task Force, the U.S. Energy Information Administration and other public bodies. These sources are used for energy data, policy context, market structure, infrastructure exposure, military expenditure, environmental damage and sanctions-related analysis.

The second category is legal and policy documentation. This includes EU regulations, Commission communications, sanctions measures, NATO policy material, UN documents and relevant international legal instruments. These sources are used to assess the policy framework within which fossil fuel dependence, energy security, critical infrastructure protection and transition policy are addressed.

The third category is academic literature. This includes research on the resource curse, rentier-state theory, petro-aggression, resource conflict, energy security, climate security, environmental harm in conflict and critical minerals. Academic sources are used to test the paper's conceptual claims and to avoid relying only on contemporary policy reporting.

The fourth category is think-tank and policy research. This includes work by energy-security institutes, sanctions-monitoring organisations, conflict-research bodies and environmental-policy organisations. Such sources are used where they provide detailed monitoring, specialist interpretation or timely analysis that may not yet be available in official publications.

The fifth category is investigative and open-source reporting. This includes reporting on oil smuggling, sanctions evasion, shadow fleets, attacks on infrastructure, illicit trade routes, militia control of oil facilities and wartime environmental damage. These sources are used cautiously and, where possible, cross-checked against official or institutional sources.

The sixth category is data sources. These include energy-flow data, trade statistics, market reports, military-expenditure datasets, environmental-damage assessments, maritime chokepoint data and critical-minerals assessments. Where figures are used, the White Paper seeks to distinguish between measured data, estimates, projections and illustrative comparisons.

The use of multiple source categories is necessary because no single source type covers the full subject. Official sources provide authority but may lag behind events. Academic literature provides conceptual depth but may not capture the latest crises. Investigative reporting provides detail but may require corroboration. Data sources provide quantitative grounding but can vary in definitions and time periods. The methodology therefore uses triangulation where possible.

I.4 Limits of attribution and causation

Attribution is a central challenge in any analysis of resources and conflict. Fossil fuels can be strategically significant without being the sole cause of a war. For this reason, the paper distinguishes between direct causation, enabling conditions, coercive use, conflict multiplication and environmental consequence.

A direct causal claim is made only where control over fossil fuel reserves, revenues, territory, infrastructure or transit routes is a material driver of escalation. Even in such cases, the paper treats fossil fuels as one factor among several unless evidence clearly supports a stronger claim.

In many cases, fossil fuels are treated as enabling factors rather than direct causes. Hydrocarbon revenues may provide fiscal capacity, foreign exchange or illicit income that sustains conflict. This does not mean that fossil fuels created the political grievance or military objective that led to war. It means that fossil fuel income helped sustain the capacity to fight, repress, evade sanctions or maintain patronage networks.

In other cases, fossil fuels are treated as instruments of coercion. This applies where supplies, prices, contracts, ownership structures, pipelines, ports, storage, chokepoints or energy infrastructure are used deliberately to pressure another actor. The paper distinguishes deliberate coercion from ordinary market volatility. Not every price increase is energy weaponisation. A coercion claim requires evidence of intent, threat, manipulation or strategic use of energy dependence.

Fossil fuels can also operate as conflict multipliers. This applies where dependence, route concentration or infrastructure vulnerability increases the severity of an existing crisis. A chokepoint disruption, pipeline attack or import shock may not cause the original conflict, but it may widen its economic and political consequences.

Environmental consequence is treated separately. Fossil fuel extraction, combustion, sabotage, scorched-earth tactics or attacks on energy infrastructure can produce long-term ecological and public-health harm. This harm may deepen instability, increase reconstruction costs, weaken livelihoods and undermine state capacity. The paper does not claim that environmental damage automatically causes conflict. It treats environmental degradation as a factor that can aggravate fragility, particularly where governance is already weak.

The paper therefore avoids deterministic claims. It does not argue that oil, gas or coal mechanically produce war, authoritarianism or instability. It argues that fossil fuel systems create recurring and identifiable pathways of risk. This narrower claim is more defensible and more useful for policy.

I.5 Classification framework

The White Paper uses five analytical categories to classify fossil fuel involvement in conflict and insecurity. These categories are not legal definitions. They are analytical tools intended to make the argument clearer and more consistent.

A case may fall into more than one category. For example, Russia's fossil fuel relationship with Europe includes coercion, conflict finance, import dependence and infrastructure exposure. ISIS oil smuggling is primarily an enabling-factor case, but it also involves territorial control and illicit trade. The Niger Delta is primarily an environmental-consequence and grievance-amplifier case, but also includes oil theft and governance failure. The classification therefore identifies the dominant mechanism rather than reducing complex cases to a single cause.

Category	Definition	Typical mechanism	Illustrative examples
Direct cause	Conflict in which control over reserves, revenue, territory or transit routes is a material driver of escalation.	Competition over ownership, territory or strategic access.	Iraq–Kuwait 1990; some pipeline and transit disputes.
Enabling factor	Fossil fuel revenues materially sustain military operations, repression, patronage or armed groups.	State fiscal capacity, illicit sales, oil smuggling, sanctions evasion.	Russia's war finance; ISIS oil sales; Libya's oil-terminal struggles.
Instrument of coercion	Supply, pricing, contracts, ownership or infrastructure are used to compel another actor.	Supply cuts, payment demands, threats to shipping or pipelines.	1973–74 oil embargo; Russia's gas pressure on Europe; Hormuz threats.
Conflict multiplier	Dependence increases the severity of a crisis once it begins.	Price shocks, route concentration, infrastructure fragility, import vulnerability.	EU gas shock after 2022; Red Sea disruption; Black Sea route exposure.
Environmental consequence	*Extraction, combustion or wartime targeting creates ecological harm that worsens instability or recovery.*	Spills, fires, methane releases, toxic contamination.	Kuwaiti oil wells; Ogoniland; attacks on Ukraine's energy infrastructure.

Table 3. Typology of fossil fuel involvement in conflict

This classification framework is used throughout the paper to avoid conflating different forms of fossil fuel-related insecurity. A conflict over oil reserves is not the same as a gas-supply cut. Oil smuggling by an armed group is not the same as a maritime chokepoint crisis. Environmental damage from burning wells is not the same as hydrocarbon revenue financing military expenditure. Each pathway requires separate analysis and different policy responses.

The classification also supports the paper's core policy argument. If fossil fuels create multiple types of security risk, the response cannot be limited to supplier diversification. It must include demand reduction, sanctions enforcement, critical infrastructure protection, maritime security, environmental accountability, critical-minerals strategy and transition planning.

I.6 Application of the framework

The framework is applied in the main chapters in three ways.

First, it structures the analysis of historical cases. Chapter 2 uses it to distinguish between fossil fuels as strategic military inputs, objects of territorial ambition, instruments of leverage and sources of environmental damage.

Secondly, it informs the political-economy analysis. Chapter 3 considers how fossil fuel rents affect state power, authoritarian resilience, corruption risk, military spending and import dependence. These are primarily enabling and vulnerability pathways rather than simple direct-cause claims.

Thirdly, it guides the policy recommendations. Chapter 10 links each risk category to a policy response. Coercion requires reduced dependence, storage, interconnection and solidarity mechanisms. Conflict finance requires sanctions enforcement and revenue restriction. Infrastructure exposure requires protection, monitoring and resilience planning. Environmental consequence requires documentation, remediation and recovery planning. Transition-related risks require critical-minerals policy, recycling, industrial capacity and grid security.

The framework should not be read as a rigid coding system. It is a structured guide for policy analysis. Its purpose is to ensure that the White Paper remains analytically careful, avoids exaggerated claims and gives policymakers a practical way to understand the security implications of fossil fuel dependence.

I.7 Methodological limits

Several limits should be noted:

1. The White Paper relies on publicly available information. Some relevant information on energy contracts, intelligence assessments, sanctions evasion, military targeting and illicit fuel trade is not publicly available. Where information is incomplete, the paper uses cautious language.
2. Available data are not always directly comparable. Energy statistics may use different time periods, units or definitions. Military spending, fossil fuel revenues and sanctions-evasion estimates may be reported in different currencies and methodologies. The paper therefore avoids presenting incomparable figures as direct equivalents.
3. Some case studies are politically contested. Claims about motive, intent and causation can differ between governments, institutions, scholars and media sources. The paper therefore focuses on documented mechanisms rather than speculative intent.
4. The clean-energy transition is itself dynamic. Critical minerals, battery technology, grid investment, renewable deployment, hydrogen, storage and industrial policy are changing rapidly. The paper’s conclusions on transition risks should therefore be read as a strategic assessment, not as a fixed technical forecast.
5. The paper is European in policy orientation. It draws on global cases but frames its recommendations primarily for the EU, NATO, Member States and allied policy communities. Other regions may require different policy tools.

These limitations do not weaken the main argument. They define its scope. The White Paper does not offer a universal theory of war. It offers an analytical framework for understanding how fossil fuel dependence creates recurring security vulnerabilities and how a managed transition can reduce some of those vulnerabilities while requiring careful management of new risks.

Annex II

Typology of Fossil Fuel Involvement in Conflict

II.1 Purpose of the typology

This annex expands the analytical categories used throughout the White Paper. Its purpose is to distinguish between different forms of fossil fuel involvement in conflict and insecurity. This distinction is important because fossil fuels do not affect war, coercion and instability in a single way.

In some cases, oil, gas or coal may be directly connected to territorial ambition, revenue disputes or control over strategic infrastructure. In others, fossil fuels provide revenue that enables military operations or armed-group activity without being the original cause of violence. In other cases, fossil fuel supplies, routes or infrastructure are used as instruments of coercion. Fossil fuel dependence can also multiply the effects of a crisis by exposing states to price shocks, supply disruption or infrastructure vulnerability. Finally, fossil fuel extraction, combustion and wartime targeting can create environmental damage that worsens instability and complicates recovery.

The typology is therefore designed to avoid a simplified “resource war” explanation. It recognises that conflicts are usually driven by multiple causes, while still identifying the specific ways in which fossil energy can shape strategic outcomes.

The five categories used in this White Paper are:

1. Direct cause
2. Enabling factor
3. Instrument of coercion
4. Conflict multiplier
5. Environmental consequence

These categories are analytical rather than legal. They are intended to support policy assessment, not to assign legal responsibility or determine liability. A single case may fall into several categories at once. The typology identifies the dominant mechanism, while recognising overlap.

II.2 Direct cause

A direct-cause case is one in which access to, control over, or revenue from fossil fuel resources, transit routes or energy territory is a material driver of escalation. This does not mean that fossil fuels are the only cause of the conflict. It means that the conflict cannot be properly understood without considering fossil fuel-related interests.

Direct-cause cases may involve competition over oilfields, gas reserves, coal deposits, export routes, pipeline corridors, ports, terminals, maritime zones or revenue-producing territory. They may also involve disputes over production levels, pricing, compensation, debts, transit fees or the distribution of resource income.

The threshold for classifying a case as a direct cause should be high. Fossil fuels should be treated as a direct cause only where there is evidence that control over reserves, revenue, infrastructure or transit routes was a significant factor in decision-making or escalation. Where fossil fuel interests are present but secondary, the case should be classified under another category, such as enabling factor or conflict multiplier.

The Iraq–Kuwait crisis of 1990 is often discussed in this context because oil reserves, debt, production disputes and revenue pressures formed part of the strategic background to Iraq's invasion. However, even this case should be treated carefully. Oil was central, but the crisis also involved regional power, regime calculation, post-war debt, diplomatic misjudgement and security assumptions. It is therefore better described as a partial direct-cause case rather than as a simple oil war.

Direct-cause cases are policy-relevant because they show how fossil fuel assets can become strategic objectives. Where reserves, export routes or infrastructure are treated as prizes, conflicts may be harder to resolve because the economic and military value of the assets increases the incentive to hold territory or infrastructure.

Indicators of direct-cause involvement may include stated claims over resource territory, military operations directed at energy assets for control rather than only disruption, bargaining positions centred on production or revenue, disputes over transit infrastructure, or elite decision-making in which fossil fuel control appears as a major objective.

II.3 Enabling factor

An enabling-factor case is one in which fossil fuel revenue, production, smuggling or infrastructure materially supports conflict capacity. In this category, fossil fuels may not cause the conflict, but they help sustain the actor's ability to fight, repress, evade sanctions or maintain political control.

For states, fossil fuel revenues can provide fiscal resources, foreign exchange and budgetary flexibility. These funds may support military expenditure, internal security services, arms procurement, intelligence structures, subsidies, patronage networks or proxy activity. For non-state actors, oilfields, refineries, fuel depots, pipelines, tanker routes or smuggling networks can provide revenue and logistics.

The enabling-factor category is particularly important because it avoids overstating causation. A regime may begin a war for reasons unrelated to oil or gas, but hydrocarbon income may allow it to sustain the war for longer. An armed group may mobilise for ideological or territorial reasons, but fuel smuggling may provide operational finance. A fragmented state may already suffer from institutional weakness, but competition over oil terminals may intensify factional power.

Russia's fossil fuel exports during the war against Ukraine are a central contemporary example. The war was not caused solely by oil and gas, but fossil revenue has contributed to Russia's fiscal resilience and its ability to sustain military expenditure despite sanctions. ISIS oil smuggling in Iraq and Syria is a non-state example: captured oil assets and illicit sales helped finance operations and administration. Libya provides another example, where competing factions have used oil production and export infrastructure as sources of bargaining power.

The enabling-factor category also includes sanctions evasion. If fossil fuel exports are restricted but continue through shadow fleets, ship-to-ship transfers, third-country refining, false documentation or opaque insurance structures, the resulting revenue can remain strategically significant. This does not mean that all fossil trade with sanctioned states is illegal; it means that fossil revenue streams must be assessed as part of conflict-finance analysis.

Indicators of enabling-factor involvement may include a high share of hydrocarbon revenue in state budgets, fossil exports providing foreign exchange during conflict, documented armed-group fuel sales, control of oil terminals by militias, sanctions-evasion networks linked to fossil trade, or evidence that energy revenue supports military or coercive capacity.

II.4 Instrument of coercion

Fossil fuels become instruments of coercion when supply, price, contracts, infrastructure, ownership or transit routes are deliberately used to influence another actor's behaviour. This category concerns the use of energy as leverage.

Energy coercion may be direct or indirect. Direct coercion includes supply cuts, threats to halt exports, selective restrictions, punitive pricing, payment demands or contract manipulation. Indirect coercion may include pressure through infrastructure ownership, storage control, pipeline routing, maritime threats, cartel behaviour, artificial scarcity or strategic signalling intended to affect market expectations.

Pipeline gas is particularly susceptible to coercion because it often involves fixed routes, long-term contracts, limited substitute capacity and dependence on supplier-controlled infrastructure. Oil is generally more globally traded, but it can still be weaponised through embargoes, production policy, chokepoint threats, tanker disruption or refinery dependence. Coal is usually more flexible as a traded commodity, but industrial and logistical constraints can still create vulnerability in specific sectors.

The 1973–74 oil embargo remains the clearest historical example of deliberate fossil energy coercion. Russia's manipulation and reduction of gas supplies to Europe before and after the full-scale invasion of Ukraine is the most important recent European case. Threats involving the Strait of Hormuz show how coercion can be linked to route disruption rather than only to supplier behaviour. Houthi attacks affecting Red Sea shipping illustrate how non-state or quasi-state actors can use maritime insecurity to affect energy and trade flows.

A coercion claim should not be made lightly. Not every shortage, price increase or contractual dispute constitutes weaponisation. Markets can tighten for commercial, technical or weather-related reasons. The classification requires evidence of deliberate pressure, political intent, strategic signalling, discriminatory action, or a pattern of conduct designed to influence the target's behaviour.

Indicators of coercive use may include official threats, sudden supply reductions during political disputes, payment or contract demands linked to foreign-policy decisions, discriminatory pricing, manipulation of storage or transit, strategic ownership of critical infrastructure, or attacks and threats against routes used by political adversaries.

II.5 Conflict multiplier

A conflict multiplier is a condition that increases the severity, spread or cost of a crisis without being the primary cause. Fossil fuel dependence can act as a conflict multiplier when import exposure, route concentration, infrastructure fragility or price volatility amplifies the effects of an existing conflict or geopolitical crisis.

This category is especially relevant for importing states. A war in one region may trigger energy-price shocks in another. A chokepoint disruption may affect countries not directly involved in the conflict. A pipeline cut may increase electricity costs, industrial input prices, inflation and household pressure. A refinery strike may cause product shortages even where crude supply remains available. A tanker-route disruption may increase insurance, freight costs and delivery times.

The European gas crisis after Russia’s full-scale invasion of Ukraine is a clear conflict-multiplier case. The war itself had many causes, but Europe’s dependence on Russian gas magnified the economic effects of the crisis. Energy price increases affected inflation, industrial production, household costs and political pressure. Red Sea shipping disruption has had similar multiplier effects by affecting maritime routes, insurance costs and rerouting decisions.

Chokepoints are central to this category. The Strait of Hormuz, Bab el-Mandeb, Suez Canal, Turkish Straits, Strait of Malacca and Danish Straits demonstrate how concentrated routes can transmit local instability into wider economic risk. The point is not that every chokepoint crisis causes war. It is that chokepoints can widen the consequences of war or coercion.

Infrastructure also matters. Fossil fuel systems are centralised and capital-intensive. Pipelines, terminals, refineries, storage depots, ports and LNG facilities can become single points of failure. Their disruption may produce effects far beyond the immediate site of damage.

Indicators of conflict-multiplier involvement may include high import dependence, reliance on a small number of suppliers, absence of short-term substitutes, chokepoint exposure, limited storage, weak interconnectors, infrastructure concentration, price spikes following geopolitical events, or rapid transmission of energy shocks into inflation and public finances.

II.6 Environmental consequence

Fossil fuels create environmental consequences through extraction, transport, combustion and the targeting or destruction of energy infrastructure. In conflict settings, these consequences can become security issues because they affect public health, livelihoods, displacement, local grievance, reconstruction costs and state capacity.

Environmental consequences include oil spills, refinery fires, burning wells, methane releases, gas flaring, coal pollution, contamination of soil and groundwater, damage to fuel depots, toxic residues, damaged electricity systems and polluted industrial sites. These impacts may persist after active fighting has ended.

The burning of Kuwaiti oil wells in 1991 remains one of the most visible examples of wartime fossil fuel environmental damage. The Niger Delta illustrates the longer-term relationship between oil extraction, pollution, oil theft, illegal refining, governance failure and local insecurity. Ukraine provides a contemporary case in which attacks on energy infrastructure have created environmental, humanitarian and reconstruction consequences.

This category should also be treated carefully. Environmental damage does not automatically cause war. Climate stress, pollution or resource degradation usually interact with political institutions, governance quality, economic conditions, local grievances and conflict history. The paper therefore treats environmental harm as a threat multiplier rather than a deterministic trigger.

Environmental consequence is policy-relevant because it links energy security to post-conflict recovery. Reconstruction should not be limited to restoring energy supply. It should also include assessment of contamination, methane release, soil and water damage, toxic waste, damaged industrial sites and long-term public-health consequences.

Indicators of environmental consequence may include documented spills, fires, methane emissions, destroyed refineries or depots, contaminated water sources, damaged coal or fuel infrastructure, persistent pollution from extraction, public-health impacts, loss of livelihoods, displacement linked to environmental harm, or elevated reconstruction and remediation costs.

II.7 Overlap between categories

The categories in this typology are distinct, but real cases often overlap. A conflict may involve fossil fuels as both an enabling factor and a conflict multiplier. A state may use energy as a coercive instrument while also relying on fossil revenues for war finance. An attack on infrastructure may have military, economic and environmental consequences at the same time.

Russia’s war against Ukraine illustrates this overlap. Fossil fuel revenue has helped sustain the Russian state’s fiscal capacity. Gas supplies were used as leverage against Europe. European dependence on Russian gas multiplied the economic impact of the crisis. Energy infrastructure in Ukraine became a repeated target. Environmental damage from attacks on energy facilities added a further layer of harm.

Libya also shows overlap. Oil terminals and production facilities provide revenue, bargaining power and factional leverage. Their disruption affects state finances, public services and international energy markets. Environmental risks arise where infrastructure is damaged or poorly maintained.

The Niger Delta is another overlapping case. Fossil extraction has produced environmental degradation. Oil theft and illegal refining have supported illicit economies. Pollution has contributed to grievance. Weak governance and insecurity have reinforced one another.

Because of this overlap, the typology should not be used mechanically. Its purpose is to clarify the dominant mechanism in each case while recognising secondary effects.

II.8 Policy relevance of the typology

Each category implies a different policy response.

Where fossil fuels are a direct cause of conflict, policy should focus on resource governance, revenue-sharing arrangements, transparency, anti-corruption measures, dispute resolution, border and maritime delimitation, and protection of civilian infrastructure.

Where fossil fuels are an enabling factor, policy should focus on conflict-finance disruption, sanctions enforcement, transparency in trade flows, monitoring of illicit fuel networks, price-cap enforcement, customs co-operation, financial intelligence and anti-smuggling measures.

Where fossil fuels are instruments of coercion, policy should focus on reducing dependence, diversifying suppliers, strengthening storage, improving interconnection, increasing demand flexibility, preventing strategic infrastructure capture and developing solidarity mechanisms between allies.

Where fossil fuels are conflict multipliers, policy should focus on resilience. This includes emergency stocks, infrastructure protection, maritime security, crisis planning, alternative routes, demand reduction, electrification and price-shock mitigation.

Where fossil fuels create environmental consequences, policy should focus on documentation, accountability, remediation, reconstruction planning, public-health protection and environmental recovery.

The typology therefore supports the central policy argument of the White Paper: reducing fossil fuel dependence is not only an environmental objective. It is also a way to reduce exposure to coercion, conflict finance, infrastructure disruption and environmental insecurity. At the same time, transition policy must be designed carefully so that new dependencies in critical minerals, manufacturing, grids and storage do not reproduce similar vulnerabilities in another form.

II.9 Summary table

Category	Core analytical question	Principal risk	Policy response
Direct cause	Is control over fossil resources, revenue or routes a material driver of conflict?	Resource competition and strategic territorial objectives.	Resource governance, transparency, revenue-sharing and dispute-resolution mechanisms.
Enabling factor	Do fossil revenues sustain the capacity to fight, repress or evade sanctions?	War finance, repression, armed-group funding and sanctions evasion.	Revenue restriction, sanctions enforcement, trade monitoring and anti-smuggling measures.
Instrument of coercion	Are supplies, prices, contracts or infrastructure used as political leverage?	Energy blackmail and reduced policy autonomy.	Demand reduction, supplier diversification, storage, interconnection and solidarity mechanisms.
Conflict multiplier	Does fossil fuel dependence worsen the impact of a wider crisis?	Price shocks, route disruption, infrastructure fragility and cascading economic effects.	Resilience planning, emergency stocks, infrastructure protection, electrification and demand flexibility.
Environmental consequence	Does extraction, transport or wartime targeting create environmental harm?	Pollution, public-health damage, livelihood loss and recovery burdens.	Environmental documentation, remediation, reconstruction planning and accountability mechanisms.

Table 15. Summary table of fossil fuel-related security pathways

This typology should be used as a guide to the rest of the White Paper. It helps separate different pathways of risk and prevents the argument from becoming too broad. Fossil fuels matter in conflict not because they explain every war, but because they repeatedly create strategic opportunities, financial resources, coercive leverage, infrastructure exposure and environmental damage.

Annex III

Case Study Matrix

III.1 Purpose of the case-study matrix

This annex provides a structured overview of the principal case studies used in the White Paper. Its purpose is to allow readers to compare cases quickly and to identify the different ways in which fossil fuels interact with conflict, coercion, infrastructure vulnerability and environmental damage.

The matrix does not claim that all cases are equivalent. Some involve state coercion; others concern non-state conflict finance, environmental degradation, maritime chokepoints, civil war economies or import dependence. The purpose is not to force a single explanation onto different conflicts, but to show recurring pathways of risk.

The cases are assessed according to the typology set out in Annex II:

- Direct cause

- Enabling factor
- Instrument of coercion
- Conflict multiplier
- Environmental consequence

A case may fall into more than one category. The matrix identifies the dominant category while noting secondary dynamics where relevant.

III.2 Case-study selection

The cases were selected because they meet at least one of the following criteria:

1. The case demonstrates the use of fossil fuels as strategic leverage, revenue or infrastructure in a conflict or geopolitical crisis.
2. The case is relevant to European, NATO or wider allied security policy.
3. The case illustrates a distinct pathway within the analytical typology.
4. The case has a sufficient public evidence base to support policy analysis.
5. The case shows why fossil fuel dependence should be treated as a matter of security, not only as a matter of climate or market policy.

The cases are not exhaustive. Other examples could be added, including Algeria's hydrocarbon-backed security state, Gulf energy politics, Caspian pipeline competition, coal dependence in some emerging economies, or the role of oil in other civil wars. The selected cases are intended to provide a representative analytical sample.

Case	Region	Dominant classification	Main energy dimension	Principal security effect	Illustrative policy lesson
Russia and Europe	Europe / Eurasia	Instrument of coercion / conflict multiplier	Gas dependency and pipeline leverage	Price shock, supply pressure, policy constraint	Reduce import dependence and protect infrastructure
Ukraine	Eastern Europe	Enabling factor / environmental consequence	Russian fossil revenues and attacks on energy infrastructure	War finance, blackouts, reconstruction burden	Combine sanctions, resilience and recovery planning
Strait of Hormuz	Persian Gulf	Conflict multiplier / coercive threat	Oil and LNG chokepoint	Global market instability	Diversify routes and reduce fuel exposure
ISIS in Iraq and Syria	Middle East	Enabling factor	Illicit oil production and smuggling	Armed-group finance	Target fuel smuggling and shadow trade
Libya	North Africa	Enabling factor	Oil terminals and production control	Factional leverage and state fragmentation	Secure export governance and revenue transparency
Niger Delta	West Africa	Environmental consequence / grievance amplifier	Extraction, pollution and oil theft	Local instability and livelihood damage	Environmental remediation and governance reform

Table 12. Case-study matrix

III.3 Russia and Europe

Russia and Europe represent the White Paper's most important contemporary European case. Before the full-scale invasion of Ukraine, Russian gas was deeply embedded in European energy markets through pipelines, long-term contracts, storage relationships and commercial infrastructure. This created a dependency that was frequently defended as economically rational and mutually beneficial.

The strategic assumption behind this relationship was that interdependence would moderate behaviour. Russia needed revenue, while Europe needed gas. The events of 2022 exposed the weakness of that assumption. Russian supply reductions, payment disputes, uncertainty around pipeline flows and the wider energy-price crisis showed that a supplier may use dependence as leverage even at economic cost.

The case is classified primarily as an instrument of coercion. It also falls into the enabling-factor category because Russian fossil revenues contributed to the state's fiscal capacity during the war. It is also a conflict-multiplier case because Europe's dependence on Russian gas increased the economic and political consequences of the invasion.

The policy implication is that supplier diversification is necessary but not sufficient. The deeper strategic answer is to reduce fossil fuel demand, expand renewables, increase efficiency, strengthen storage and interconnection, enforce sanctions and avoid new forms of concentrated dependency.

III.4 Ukraine

Ukraine is treated as a separate case because it demonstrates the vulnerability of energy infrastructure in modern war. Russia's attacks on Ukraine's electricity, heating, fuel and industrial infrastructure have shown that energy systems are not only economic assets but also instruments of civilian pressure and military strategy.

The Ukrainian case links several dimensions of the White Paper. Russian fossil revenue helped sustain the aggressor state's capacity. Europe's previous dependence on Russian gas shaped the early strategic environment. Ukraine's energy infrastructure became a repeated target. Environmental damage from attacks on fuel depots, power stations, substations and industrial sites added to the burden of war and reconstruction.

The dominant category is environmental consequence and infrastructure exposure. The case also has enabling-factor and conflict-multiplier dimensions. It is particularly relevant to the policy discussion on resilient reconstruction. Rebuilding Ukraine's energy system should not mean simply restoring pre-war vulnerabilities. It should include decentralised generation, storage, grid hardening, interconnection, environmental remediation and stronger protection of critical nodes.

III.5 Strait of Hormuz

The Strait of Hormuz is one of the world's most important fossil fuel chokepoints. It connects the Persian Gulf with the Gulf of Oman and the wider Indian Ocean. Large volumes of oil and LNG exports from Gulf producers depend on this route.

This case is classified primarily as a conflict multiplier. A regional crisis, tanker incident, mining operation, missile attack, seizure or threat of closure could have consequences far beyond the Gulf. Even limited disruption can affect prices, insurance premiums, shipping behaviour and strategic planning.

Hormuz is also an instrument-of-coercion case because threats around the strait can be used as political leverage. The strategic importance of the route does not depend on a full closure. Uncertainty alone can affect markets.

For Europe, the lesson is that LNG diversification and global oil dependence still leave European economies exposed to distant maritime crises. Demand reduction, emergency stocks, maritime security and diplomacy are therefore connected policy tools.

III.6 Iraq and Kuwait

Iraq's invasion of Kuwait in 1990 is one of the most frequently cited examples of fossil fuels and conflict. Oil was not the only factor, but it was central to the strategic background. Reserves, production levels, revenue disputes, debt, regional power calculations and regime survival all interacted.

The case is classified as a partial direct-cause case. It should not be reduced to a simple oil-war narrative, but oil was material to the crisis. The subsequent burning of Kuwaiti oil wells by retreating Iraqi forces added a major environmental-consequence dimension.

This case remains important because it shows the interaction between resource value, state decision-making, military action and environmental destruction. It also demonstrates why environmental accountability and remediation must be part of post-conflict policy.

III.7 ISIS in Iraq and Syria

ISIS is the clearest non-state armed group case in the White Paper. The group captured oilfields, used rudimentary refining, sold oil through local traders and smuggling networks, and generated revenue from fuel sales and taxation. Fossil fuel control did not create ISIS, but it helped finance the group's operations and administration.

The case is classified primarily as an enabling factor. It also has direct territorial-control and illicit-economy dimensions. Oilfields and fuel routes became part of the group's conflict economy.

The policy relevance is clear. Counter-terrorism finance should include fossil fuel smuggling, local refining, taxation of fuel distribution, transport networks and cross-border trade. Military action against armed groups may need to consider the economic infrastructure that sustains them, while also limiting environmental and civilian harm where possible.

III.8 Libya

Libya illustrates the role of fossil fuel infrastructure in a fragmented state. Oil production and export infrastructure remain central to national revenue, but state fragmentation has allowed armed groups, rival authorities and local actors to use terminals, fields and blockades as bargaining tools.

The case is classified primarily as an enabling factor. Control over infrastructure affects political leverage, fiscal flows and external recognition. It also functions as a conflict multiplier because disruption to production and exports can worsen state finances and public-service delivery.

The policy implication is that oil-sector governance cannot be separated from state-building. Revenue transparency, unified institutions, protection of infrastructure, negotiated access and anti-corruption measures are central to stabilisation.

III.9 Niger Delta

The Niger Delta case concerns long-term extraction, environmental harm, grievance, oil theft and militancy. It is not a conventional interstate conflict. It is a case of fossil fuel-related insecurity within a producing region where communities have borne environmental costs while oil revenues have flowed through national and corporate structures.

The dominant category is environmental consequence. The case also includes enabling-factor dynamics because oil theft and illegal refining have supported illicit economies.

Pollution, livelihood damage and weak governance have contributed to local grievance and insecurity.

The policy relevance lies in environmental remediation, community participation, transparent revenue management, anti-theft enforcement and accountable security responses. The case shows that fossil fuel-related security risks can emerge from local environmental damage and governance failure, not only from war between states.

III.10 Sudan and South Sudan

Sudan and South Sudan illustrate the security risks of extreme oil dependence and transit vulnerability. South Sudan inherited much of the oil production after independence, while export routes remained dependent on infrastructure through Sudan. This created fiscal, political and security vulnerabilities.

The case is classified primarily as an enabling factor and conflict multiplier. Oil revenues shaped state finances, while route dependence created exposure to disruption. When exports were interrupted, the fiscal and humanitarian effects were severe.

The policy relevance is broader than the specific case. Fossil fuel-dependent states with limited diversification are vulnerable to price shocks, export-route disruption, elite competition and external pressure. Economic diversification and conflict-sensitive resource governance are therefore part of security policy.

III.11 Red Sea / Houthi attacks

The Red Sea case demonstrates how maritime insecurity can affect global energy and trade routes even when the actor disrupting shipping does not control fossil fuel resources. Houthi missile and drone attacks have affected shipping through the Bab el-Mandeb / Red Sea / Suez route, forcing rerouting, increasing insurance costs and drawing naval responses.

The case is classified primarily as a conflict multiplier. It is also an instrument-of-coercion case because attacks and threats to shipping can be used to create political and economic pressure.

The policy implication is that energy security cannot be separated from maritime security. Naval protection, intelligence, sanctions on weapons transfers, regional diplomacy and route-risk monitoring all form part of the response. However, long-term exposure also depends on the level of dependence on seaborne fossil fuel flows.

III.12 Venezuela

Venezuela is included as a political-economy case rather than a conventional war case. Its oil dependence, fiscal concentration, institutional degradation, corruption, sanctions exposure and economic collapse illustrate how reliance on fossil revenue can weaken state resilience.

The dominant category is enabling factor in the broader sense of fossil-rent political economy. Oil revenues sustained state structures and patronage for decades, while dependence on a single export sector reduced diversification. When production, prices and institutional capacity deteriorated, the consequences spread through the economy and political system.

The policy relevance is that fossil fuel dependence can create long-term fragility even without external war. For producer countries, transition planning and economic diversification are security issues. For external actors, sanctions, development policy and energy transition should be calibrated with attention to humanitarian and institutional effects.

III.13 Cross-case observations

Several patterns emerge across the cases:

1. Fossil fuels rarely operate as a single cause. They usually interact with political ambition, institutional weakness, sanctions, territorial conflict, local grievance, military strategy or external intervention.
2. Fossil fuels often matter more to the duration and scale of conflict than to its initial outbreak. Revenue, infrastructure and illicit trade can sustain violence after it begins.
3. Chokepoints and fixed infrastructure transmit local crises into wider economic effects. Hormuz, Bab el-Mandeb, Suez, the Turkish Straits and pipeline corridors show how geography creates strategic exposure.
4. Environmental damage is not peripheral. It can worsen grievances, destroy livelihoods, increase public-health risks and raise reconstruction costs.
5. European exposure is both direct and indirect. Europe may be directly affected by gas dependence, oil imports, LNG markets and sanctions policy, but it is also indirectly affected by global price shocks, shipping disruption, producer-state instability and environmental security risks.
6. The energy transition changes but does not eliminate dependence. Fossil fuel vulnerabilities can be reduced, but new risks in critical minerals, grids, storage and manufacturing must be managed.

III.14 Use of the matrix in policy analysis

The matrix can be used by policymakers in three ways:

1. It can help identify the dominant security risk in a given fossil fuel-related crisis. If the dominant risk is coercion, the response should focus on reducing dependence and strengthening resilience. If the dominant risk is conflict finance, the response should focus on revenue restriction and illicit trade. If the dominant risk is environmental damage, the response should include remediation and accountability.
2. It can support early-warning assessment. High import dependence, supplier concentration, chokepoint exposure, fossil revenue dependence, infrastructure vulnerability and weak governance are indicators that a case may become strategically significant.
3. It can help design integrated policy. Energy security, sanctions, maritime security, environmental policy, development finance and transition planning should not

operate separately. The matrix shows why fossil fuel-related insecurity crosses institutional boundaries.

This annex should therefore be read as a practical companion to the main chapters. It summarises the cases, clarifies their dominant mechanisms and supports the White Paper's central argument: fossil fuel dependence creates recurring strategic vulnerabilities that cannot be addressed by market policy alone.

Annex IV

Policy Implementation Matrix

IV.1 Purpose of the policy implementation matrix

This annex translates the White Paper's policy recommendations into a practical implementation framework. Its purpose is to show which actors are best placed to act, what type of measures are required, and how the different strands of energy security, fossil fuel reduction, critical infrastructure protection, sanctions enforcement and transition planning can be co-ordinated.

The recommendations in the main body of the White Paper are deliberately broad because fossil fuel dependence affects several policy domains at once. It is not only an energy issue. It is also a matter of defence, foreign policy, sanctions, industrial capacity, environmental protection, maritime security, development finance and civil resilience. The implementation matrix is therefore organised by actor rather than by chapter.

The principal actors considered are:

- European Union institutions
- NATO
- Member States
- Partner countries
- International financial institutions
- Civil society and research organisations

The matrix is not intended to assign exclusive responsibility. Many measures require joint action. For example, critical infrastructure protection involves EU regulation, NATO security assessment, national authorities, private operators and local emergency services. Sanctions enforcement requires EU legal instruments, Member State implementation, customs authorities, financial intelligence units, shipping services, insurers and partner-country co-operation. Energy transition requires policy frameworks, financing, industrial capacity, public consent and technical delivery.

The purpose of this annex is therefore to identify lead roles and supporting roles, while recognising that implementation will depend on co-ordination.

IV.2 European Union

The European Union has the central role in setting the policy, regulatory and market framework for reducing fossil fuel dependence. It has competence over energy-market rules, climate policy, internal market regulation, sanctions, external trade, competition policy, infrastructure funding, enlargement policy and critical raw materials strategy. It also has a growing role in economic security and critical infrastructure resilience.

The EU should formally treat fossil fuel dependence as a security vulnerability in its energy, economic-security, climate-security and external-policy documents. This does not require treating all fossil fuel imports as hostile or illegitimate. It requires systematic assessment of supplier concentration, route exposure, infrastructure lock-in, price vulnerability, sanctions exposure and revenue flows to hostile actors.

The EU's implementation priorities should include maintaining the phase-down of Russian fossil fuel imports; enforcing sanctions and price-cap measures; reducing demand through efficiency and electrification; accelerating renewable deployment; supporting grids, storage and interconnectors; developing a critical minerals security strategy; strengthening maritime and undersea infrastructure monitoring; supporting Member States with high transition burdens; and integrating energy resilience into enlargement and neighbourhood policy.

The Commission should lead on regulatory design, data collection, policy monitoring and funding instruments. The Council should provide political direction and approve sanctions, energy-security measures and external-policy decisions. The European Parliament should provide legislative scrutiny and democratic accountability. EU agencies and bodies, including ACER, ENISA and relevant energy and cyber-security institutions, should support implementation through monitoring, technical standards and risk assessment.

The EU should also improve dependency metrics. Energy security should not be measured only by aggregate import dependency. It should include supplier concentration, fuel substitutability, exposure to chokepoints, infrastructure redundancy, storage availability, critical mineral dependency, ownership risk and demand flexibility.

IV.3 NATO

NATO's role is not to regulate energy markets or design climate policy. Its role is to assess how energy vulnerability affects deterrence, military readiness, civil preparedness, infrastructure protection and resilience. The Alliance has a direct interest in energy security because military mobility, defence production, communications, logistics, bases, ports, railways, fuel depots and civilian continuity all depend on functioning energy systems.

NATO should treat fossil fuel dependence and energy infrastructure vulnerability as part of resilience planning under Article 3 of the North Atlantic Treaty. This includes assessment of fuel supply, military energy requirements, grid dependence, cyber vulnerability, undersea infrastructure exposure, maritime route risks and the implications of hostile activity against energy systems.

NATO's implementation priorities should include joint exercises involving energy-disruption scenarios; maritime surveillance of strategic routes and undersea infrastructure; protection planning for pipelines, cables, ports and offshore assets; co-operation with the EU on hybrid energy threats; intelligence-sharing on sabotage risks; cyber-resilience support; and assessment of military dependence on civilian grids and fuel supply chains.

NATO should also support allied efforts to improve operational energy resilience. This may include greater use of local generation and storage at military bases, improved fuel logistics, efficiency measures that reduce supply vulnerability, and contingency planning for energy disruption during crisis. Such measures should be pursued where they strengthen operational readiness and do not create new vulnerabilities.

EU-NATO co-operation is particularly important. The EU has regulatory, funding and market instruments. NATO has military, intelligence and deterrence capabilities. Hybrid threats against energy systems often sit between these domains. A structured EU-NATO energy-security interface should therefore be maintained, with regular scenario exercises and clear division of roles.

IV.4 Member States

Member States carry the main responsibility for implementation on national territory. They control national energy mixes, permitting, emergency planning, infrastructure protection, civil protection, building renovation, transport policy, law enforcement, customs control, national security screening and many aspects of grid development.

Each Member State should conduct a fossil fuel security-risk assessment. This assessment should identify dependence on specific suppliers, fuels, routes and infrastructure; exposure to price shocks; availability of substitutes; storage and interconnection capacity; critical infrastructure vulnerabilities; and the role of fossil fuel demand in households, transport, industry and defence.

Member States should then convert this assessment into national resilience plans. These should include measures to reduce fossil fuel demand, expand renewables, strengthen grids, protect critical infrastructure, improve storage, prepare for cyberattacks, secure ports and LNG terminals, and maintain emergency stocks where appropriate.

Building renovation and heat-sector reform should be treated as security priorities. In many Member States, heating demand remains a major source of gas vulnerability. Retrofitting buildings, deploying heat pumps, improving district heating and reducing peak winter demand can lower exposure to imported gas.

Transport policy should also be part of energy security. Oil dependence remains a central vulnerability. Electrification of vehicles, public transport, rail freight, logistics efficiency and charging infrastructure all reduce exposure to global oil markets.

Member States also have a central role in sanctions enforcement. Customs authorities, port authorities, financial intelligence units, maritime registries, insurers, trading companies and law-enforcement agencies must co-operate to detect evasion, shadow-fleet activity, false documentation, ship-to-ship transfers and suspicious re-export patterns.

Public communication is also a national responsibility. Energy transition and fossil fuel reduction require public consent. Governments should explain clearly that efficiency, electrification, grids and renewables are not only environmental measures but also tools for reducing vulnerability to coercion and price shocks.

IV.5 Partner countries

Partner countries are important to the implementation of this White Paper for three reasons. First, some are energy suppliers or transit states. Secondly, some are vulnerable to fossil fuel revenue decline. Thirdly, some are potential partners in renewable energy, critical minerals, hydrogen, grid interconnection or industrial supply chains.

The EU and its allies should avoid treating partner countries only as sources of replacement fuel or raw materials. A security-oriented transition requires partnerships that support diversification, resilience, governance and local value creation. Otherwise, energy transition risks reproducing extractive dependency patterns in a new form.

For fossil fuel-exporting partner countries, the main issue is economic diversification. A decline in global fossil fuel demand may create fiscal stress, unemployment, elite competition and instability if not managed. EU and international support should focus on public-finance reform, non-fossil industrial development, renewable deployment, methane reduction, flaring reduction, transparent resource governance and social protection.

For critical minerals partners, policy should prioritise responsible sourcing, environmental safeguards, labour standards, local processing, revenue transparency and infrastructure development. Partnerships should not simply move extraction risk outside Europe. They should help producer countries avoid the governance weaknesses associated with earlier resource-dependent models.

For neighbouring and enlargement countries, energy resilience should be treated as part of political and security integration. This includes reducing dependence on hostile suppliers, improving interconnection with European markets, strengthening regulators, reducing coal dependence where feasible, improving grids and expanding renewable generation.

For fragile and conflict-affected countries, decentralised energy systems can support resilience. Solar, storage, microgrids and efficient appliances can help maintain hospitals, schools, water systems and local economic activity where central systems are weak or fuel imports are vulnerable.

IV.6 International financial institutions

International financial institutions have a central role in financing the transition from fossil fuel dependence to energy resilience. This includes the European Investment Bank, the World Bank, the International Monetary Fund, regional development banks and national development finance institutions.

Their role should not be limited to climate finance. They should treat energy transition, fossil fuel dependency reduction and resilience as security-relevant investments. Projects that reduce import dependence, strengthen grids, improve efficiency, support decentralised energy and diversify fossil fuel-dependent economies should be assessed partly through their contribution to stability.

International financial institutions should support building renovation, renewable generation, grid expansion, storage, interconnectors, clean public transport, industrial electrification and critical infrastructure resilience. They should also support economic diversification in fossil fuel-exporting states, particularly where fiscal dependence on hydrocarbons creates future instability risks.

Debt and fiscal policy are relevant. Many fossil fuel-dependent countries face budgetary exposure to price swings and future demand decline. IFIs can support fiscal reform, subsidy reform, debt instruments linked to transition, and investment in non-fossil sectors. However, subsidy reform must be socially managed. Abrupt fuel-price increases without compensation can create unrest.

IFIs should also fund environmental remediation where fossil fuel extraction or conflict has created contamination. Oil spills, damaged refineries, polluted rivers, coal-mine closure and destroyed energy infrastructure can impose long-term costs that exceed the capacity of fragile states. Remediation should be treated as part of recovery and resilience.

Financing conditions should include transparency and anti-corruption standards. Fossil fuel sectors have often been associated with patronage and rent capture. Transition finance should not reproduce those patterns.

IV.7 Civil society and research organisations

Civil society and research organisations have several roles in implementing the White Paper's recommendations. They can monitor risks, scrutinise policy, support public debate, provide independent analysis, document environmental damage, expose sanctions evasion, and help affected communities participate in transition planning.

Research organisations should develop improved indicators for fossil fuel security risk. These may include supplier concentration, import dependency, chokepoint exposure, fossil revenue risk, infrastructure vulnerability, sanctions leakage, critical minerals concentration and transition readiness. Independent monitoring can help policymakers identify emerging vulnerabilities before they become crises.

Civil society organisations can support transparency in energy governance. This includes monitoring fossil fuel subsidies, lobbying, political finance, infrastructure ownership, environmental damage, oil spills, methane emissions and community impacts. In fragile or conflict-affected regions, civil society can also document pollution, displacement, livelihood damage and public-health impacts.

Investigative journalists and open-source analysts have an important role in tracking illicit fuel trade, shadow fleets, ship-to-ship transfers, re-export channels, oil theft and infrastructure attacks. Their work can inform sanctions enforcement and public accountability, provided findings are carefully verified.

Civil society also matters for democratic legitimacy. Energy transition affects households, workers, communities and regions. Public support cannot be assumed. Organisations representing workers, consumers, local communities and environmental interests should be included in consultation on grid expansion, renewable projects, industrial transition, coal phase-out and critical minerals policy.

Academic institutions should continue to test the causal claims made in energy-security analysis. This White Paper avoids deterministic claims, but future research should refine the understanding of how fossil fuel dependence interacts with war, coercion, authoritarian resilience, climate stress and transition risk.

Action area	Lead actors	Illustrative measures	Implementation horizon	Key challenge
Demand reduction and electrification	EU, Member States, utilities	Efficiency, heat pumps, industrial electrification, flexible demand	Short to medium term	Investment and deployment pace
Renewables, grids and storage	Member States, TSOs, European Commission	Permitting reform, interconnectors, storage, grid reinforcement	Medium term	Permitting delays and local opposition
Critical infrastructure protection	EU, NATO, national authorities, operators	Monitoring, joint exercises, incident protocols, cyber defence	Immediate to medium term	Civil-military co-ordination
Sanctions and revenue restriction	EU, G7, customs and financial regulators	Shadow-fleet enforcement, insurance controls, trade tracing	Immediate	Evasion and third-country rerouting
Critical minerals strategy	EU, Member States, industry	Diversified sourcing, processing, recycling, strategic reserves	Medium to long term	Concentration in processing capacity
Producer-country diversification	EU, IFIs, partner governments	Transition finance, diversification support, governance assistance	Long term	Political instability and absorption capacity

Table 13. Policy implementation matrix

IV.8 Sequencing of implementation

Implementation should be sequenced. Not every measure can be delivered at the same speed.

Immediate measures should focus on reducing exposure to active threats. These include sanctions enforcement, infrastructure protection, emergency planning, storage management, maritime monitoring, cyber resilience and support for Ukraine's energy infrastructure.

Medium-term measures should focus on structural reduction of fossil fuel demand. These include building renovation, heat-pump deployment, transport electrification, industrial efficiency, grid expansion, renewable permitting, storage and interconnectors.

Long-term measures should focus on avoiding new strategic dependencies. These include critical minerals strategy, recycling, domestic and allied processing, industrial capacity, partner-country diversification, transition finance and responsible supply chains.

The implementation framework should therefore avoid two errors. The first error would be to focus only on emergency fossil fuel supply diversification and neglect structural demand reduction. The second would be to pursue transition without resilience, creating new dependencies in minerals, grids, manufacturing and digital systems.

A successful policy approach must do both: manage the current fossil fuel security problem while building a less coercible energy system.

IV.9 Co-ordination requirements

The implementation agenda requires strong co-ordination between institutions.

At EU level, energy, climate, trade, sanctions, competition, industrial, enlargement and external-policy instruments should be aligned. A measure that reduces emissions but creates dangerous supplier concentration should be reassessed. A sanctions measure that restricts fossil revenue should be supported by demand reduction and alternative supply. A critical minerals partnership should be linked to environmental and governance safeguards.

Between the EU and NATO, co-ordination should focus on infrastructure, maritime security, hybrid threats, cyber resilience and exercises. The EU should lead on market regulation and funding. NATO should lead on military risk assessment, deterrence and defence-related resilience. Both should share analysis where mandates overlap.

Within Member States, ministries responsible for energy, defence, foreign affairs, finance, transport, environment, industry and interior affairs should work together. Energy security cannot be left to energy ministries alone.

With the private sector, governments must establish trusted channels for threat information, incident response and resilience planning. Many critical assets are privately owned, but their disruption has public consequences.

With civil society and communities, policy must be transparent. Transition cannot succeed if it is seen as imposed or if local costs are ignored.

IV.10 Implementation risks

Several risks may weaken implementation.

The first is policy fragmentation. Energy, defence, climate, sanctions and industrial policy may remain in separate institutional silos.

The second is short-termism. Governments may respond to crises by locking in new fossil infrastructure rather than reducing demand.

The third is uneven enforcement. Sanctions may be strong on paper but weakened by loopholes, shadow fleets, third-country rerouting or weak customs capacity.

The fourth is infrastructure delay. Grids, storage, interconnectors and renewable projects may be slowed by permitting, local opposition or supply-chain bottlenecks.

The fifth is new dependency. Europe may reduce Russian fossil dependence while becoming overdependent on a narrow set of LNG suppliers, critical mineral processors or clean-technology manufacturers.

The sixth is social resistance. Households, workers and regions affected by transition may resist if costs are unfairly distributed.

The seventh is underinvestment in resilience. Energy systems may become more electrified without sufficient cyber security, spare equipment, repair capacity or grid hardening.

The eighth is neglect of producer-country instability. Fossil fuel-exporting partner countries may face fiscal and political pressure as demand shifts.

These risks do not invalidate the White Paper's recommendations. They show why implementation must be planned, financed, monitored and adjusted.

IV.11 Summary

The implementation matrix turns the White Paper's central argument into an institutional agenda. Fossil fuel dependence creates security risks through coercion, conflict finance, infrastructure exposure, price shocks and environmental damage. Reducing those risks requires action by the EU, NATO, Member States, partner countries, international financial institutions, civil society and research organisations.

No single actor can deliver the agenda alone. The EU can set the framework, NATO can strengthen resilience and deterrence, Member States can implement national measures, partner countries can co-operate on diversification and transition, international financial institutions can finance resilience, and civil society can provide scrutiny and evidence.

The implementation challenge is to move from crisis response to strategic resilience. Europe should not treat energy security as a permanent search for alternative fossil fuel suppliers. It should treat energy transition as a way of reducing the strategic power of fossil fuels themselves.

Annex V

Suggested Indicators for Monitoring Fossil Fuel Security Risk

V.1 Purpose of the indicator framework

This annex proposes a set of indicators for monitoring fossil fuel-related security risk. Its purpose is to help policymakers, analysts, researchers and civil society organisations move from general assessment to structured monitoring.

The indicators are not intended to create a single numerical index. Fossil fuel security risk cannot be reduced to one score without losing important context. A country may have low supplier concentration but high chokepoint exposure. Another may have diversified imports but fragile domestic infrastructure. A third may be exposed not through imports, but through dependence on fossil fuel revenue. The framework therefore proposes a dashboard approach.

The indicators are grouped into six categories:

1. Import dependency indicators
2. Supplier concentration indicators
3. Chokepoint exposure indicators
4. Fossil revenue-risk indicators
5. Infrastructure vulnerability indicators
6. Critical minerals dependency indicators

These categories reflect the main argument of the White Paper. Fossil fuels become security risks when dependence is high, suppliers are concentrated, routes are vulnerable, revenues finance coercive actors, infrastructure is fragile, and transition creates unmanaged new dependencies.

The indicators should be used to identify trends, compare exposure between countries, test policy progress and support early warning. They can also be used to assess whether energy transition is reducing fossil fuel vulnerability or merely shifting dependence from one category to another.

V.2 Import dependency indicators

Import dependency is the starting point for fossil fuel security analysis. A state that imports a large share of its energy is not automatically insecure, but import dependence becomes a security concern when supplies are concentrated, politically exposed, hard to substitute or linked to unstable routes.

The first indicator is total energy import dependency. This measures the share of total energy consumption met through imports. It provides a broad picture of exposure, but it is too general to be used alone.

The second indicator is fossil fuel import dependency by fuel type. Oil, natural gas, LNG, coal and petroleum products should be assessed separately. Oil exposure may affect transport and military logistics. Gas exposure may affect heating, power generation and industry. Coal exposure may affect electricity or steel production in specific economies.

The third indicator is sectoral fossil fuel dependence. This examines how dependent major sectors are on imported fossil fuels. The most important sectors are electricity generation, residential heating, transport, heavy industry, agriculture, fertiliser production, military logistics and public services.

The fourth indicator is short-term substitutability. A country may be import-dependent but resilient if it can switch suppliers, fuels or demand patterns quickly. Conversely, a country may be highly vulnerable if infrastructure, contracts or industrial processes make rapid substitution difficult.

The fifth indicator is seasonal exposure. Gas-dependent heating systems may be particularly vulnerable before or during winter. Oil-dependent transport systems may be more exposed during periods of high demand or crisis mobilisation.

The sixth indicator is demand flexibility. A system with flexible demand, storage, efficiency measures and demand-response tools is less vulnerable than one where consumption is rigid.

These indicators help distinguish between ordinary import dependence and strategic vulnerability. The policy objective is not necessarily to eliminate all imports, but to reduce coercible imports and increase flexibility.

V.3 Supplier concentration indicators

Supplier concentration measures whether a state depends excessively on one supplier or a small group of suppliers. It is one of the most important indicators of coercion risk.

The first indicator is the share of imports supplied by the largest supplier. If one supplier provides a large share of gas, oil or coal, the importing state may be vulnerable to political pressure, technical disruption, pricing leverage or contract manipulation.

The second indicator is the combined share of the top three suppliers. This gives a broader picture of concentration. A state may not rely on a single dominant supplier but may still depend on a narrow supplier group.

The third indicator is political-risk exposure. Supplier concentration is more serious where suppliers are authoritarian, unstable, sanctioned, hostile, conflict-affected or willing to use energy as leverage.

The fourth indicator is contractual exposure. Long-term contracts, take-or-pay clauses, destination restrictions, payment terms, arbitration conditions and infrastructure-linked contracts can increase dependency.

The fifth indicator is ownership exposure. Foreign ownership or operational control of strategic infrastructure may create risks even where commodity supply appears diversified. Storage sites, pipelines, terminals, ports, grid assets and digital systems should be assessed.

The sixth indicator is supplier replaceability. A supplier may have a high market share, but risk is lower if alternatives can be secured quickly through existing infrastructure. Risk is higher where alternatives require new terminals, pipelines, refineries or industrial adaptation.

The seventh indicator is allied-dependency alignment. Dependence on a supplier that also supplies several allies can create collective exposure. If multiple states depend on the same supplier or route, disruption may be systemic rather than national.

Supplier concentration indicators are especially relevant to gas markets, LNG procurement, oil refining configurations and critical minerals. They should be updated regularly because market shares can change quickly during crisis.

V.4 Chokepoint exposure indicators

Chokepoint exposure measures dependence on narrow maritime passages, canals, straits and infrastructure corridors. Fossil fuel systems are particularly exposed to chokepoints because oil and LNG are transported in large volumes through limited routes.

The first indicator is the share of imported oil, LNG or petroleum products passing through major maritime chokepoints. Relevant routes include the Strait of Hormuz, Bab el-Mandeb, Suez Canal / SUMED, Turkish Straits, Strait of Malacca and Danish Straits.

The second indicator is route concentration. A country may import from several suppliers but still rely on the same maritime route. Diversification of suppliers is less useful if cargoes remain exposed to a single chokepoint.

The third indicator is alternative-route availability. Some disruptions can be managed through rerouting, but rerouting increases time, cost, insurance and vessel demand. The cost and feasibility of alternatives should be assessed.

The fourth indicator is insurance and freight sensitivity. Rising insurance premiums, war-risk premiums or freight costs can signal increased chokepoint risk even before physical disruption occurs.

The fifth indicator is naval and maritime-security exposure. This includes the presence of conflict, piracy, missile threats, drone threats, mining risk, state harassment, tanker seizures, blockade threats or great-power confrontation near energy routes.

The sixth indicator is port and terminal dependency. Chokepoint exposure does not end at sea. Importing states may depend on a small number of ports, LNG terminals, refineries or storage sites.

The seventh indicator is global market sensitivity. Even if a country does not import directly through a given chokepoint, global oil and LNG prices may rise if that chokepoint is threatened. This means chokepoint exposure can be indirect.

Chokepoint indicators should be monitored jointly by energy ministries, maritime authorities, defence establishments, insurers, port operators and market analysts. They are relevant to both energy security and maritime security.

V.5 Fossil revenue-risk indicators

Fossil revenue-risk indicators assess whether oil, gas or coal revenues strengthen actors that may finance aggression, repression, armed groups or destabilising activities. These indicators are relevant both to producer states and to importing states that may indirectly finance hostile actors through energy purchases.

The first indicator is fossil fuel revenue as a share of government revenue. A high share suggests that state capacity, public spending and security structures may depend heavily on hydrocarbons.

The second indicator is fossil exports as a share of total exports. A high share indicates vulnerability to price shocks and transition risk.

The third indicator is fossil revenue as a share of foreign-exchange earnings. This is particularly important for states that need hard currency for imports, debt service, military procurement or patronage.

The fourth indicator is military expenditure relative to fossil revenue. This does not prove that fossil revenue directly funds military spending, but it helps identify states where hydrocarbon income may support military capacity.

The fifth indicator is sanctions exposure. Fossil revenue risk is higher where the producer state is sanctioned, under investigation, involved in aggression, or linked to proxy networks.

The sixth indicator is evidence of revenue circumvention. Shadow fleets, ship-to-ship transfers, false documentation, opaque insurance, third-country refining and unusual trade flows may indicate attempts to preserve fossil revenues despite sanctions.

The seventh indicator is armed-group access to fossil assets. Oilfields, refineries, depots, fuel routes, smuggling networks and taxation of fuel distribution may provide income to non-state actors.

The eighth indicator is corruption and transparency risk. Weak revenue governance increases the risk that fossil income supports patronage, repression or illicit networks.

The ninth indicator is fiscal transition risk. Producer states highly dependent on fossil revenue may face instability if demand falls or prices decline. This is not a reason to delay transition, but it is a reason to support diversification.

These indicators help connect energy trade to conflict finance. They also help policymakers evaluate whether sanctions, price caps, transparency measures and demand reduction are affecting revenue available to hostile or unstable actors.

V.6 Infrastructure vulnerability indicators

Infrastructure vulnerability indicators assess the exposure of energy systems to attack, sabotage, accident, cyber operations, extreme weather and technical failure. Fossil fuel infrastructure is often centralised, hazardous and difficult to repair quickly.

The first indicator is critical-node concentration. This measures whether a country depends on a small number of pipelines, LNG terminals, refineries, ports, storage sites, substations or interconnectors.

The second indicator is redundancy. A resilient system has alternative routes, spare capacity, backup power, storage and repair options. A fragile system has single points of failure.

The third indicator is cross-border dependency. Pipelines, electricity interconnectors, undersea cables and transit routes may depend on neighbouring states. This can create vulnerability during political disputes or conflict.

The fourth indicator is physical-security exposure. Facilities should be assessed for vulnerability to sabotage, drones, missile attack, mines, insider threats, protests, terrorism or military operations.

The fifth indicator is cyber-security exposure. Energy systems increasingly depend on digital control, sensors, remote operation, market platforms and communications. Cyber incidents can disrupt operations even where physical infrastructure remains intact.

The sixth indicator is repair capacity. Some components, such as large transformers, specialised valves, compressors, undersea cables and LNG equipment, may be difficult to replace quickly. Spare-parts availability should be monitored.

The seventh indicator is environmental hazard. Refineries, fuel depots, pipelines, coal facilities and LNG terminals may create pollution, fires, explosions or toxic releases if damaged.

The eighth indicator is climate exposure. Floods, storms, heatwaves, wildfires and sea-level rise can affect ports, pipelines, power plants, grids and storage sites.

The ninth indicator is ownership and operational control. Infrastructure owned or operated by entities linked to hostile states or opaque corporate structures may create additional risk.

Infrastructure vulnerability indicators should be used in national risk assessments, EU resilience planning, NATO civil-preparedness analysis and private-sector security reviews.

V.7 Critical minerals dependency indicators

Critical minerals dependency indicators are included because energy transition reduces some fossil fuel risks but creates new supply-chain risks. A credible energy-security framework must monitor both.

The first indicator is import dependence for strategic raw materials. Lithium, cobalt, nickel, graphite, copper, rare earth elements and other materials should be assessed according to their role in batteries, grids, wind turbines, solar panels, electric vehicles, defence systems and industrial equipment.

The second indicator is processing concentration. Mining location is only part of the issue. Refining, separation, cathode production, anode production, magnet manufacturing and battery-cell production may be more concentrated than extraction.

The third indicator is dependence on a single third country. This should be measured against EU Critical Raw Materials Act benchmarks and updated regularly.

The fourth indicator is recycling capacity. A country or region with strong recycling capacity is less exposed over the long term. Battery recycling, rare earth magnet recovery, copper recycling and solar-panel recycling should be monitored.

The fifth indicator is substitution potential. Technologies that can reduce cobalt, nickel, rare earths or lithium dependence improve resilience. Alternative battery chemistries and material-efficient designs should therefore be assessed.

The sixth indicator is strategic stock availability. Selected materials and components may require strategic reserves, particularly where they are essential to grids, defence systems or emergency repair.

The seventh indicator is environmental and governance risk in supplier countries. Critical mineral supply should be assessed for corruption, conflict risk, labour abuses, environmental damage and political instability.

The eighth indicator is industrial capacity. Europe’s ability to process, refine, manufacture, repair and recycle clean-energy technologies affects strategic autonomy.

The ninth indicator is exposure to export controls. If a supplier controls a large share of processing or manufacturing, export restrictions can disrupt deployment.

The purpose of these indicators is not to argue against energy transition. It is to ensure that transition reduces fossil fuel vulnerability without creating unmanaged new dependencies.

Indicator category	What to monitor	Illustrative metric	Why it matters	Indicative use
Import dependency	Reliance on imported oil, gas or coal	Share of energy imports in total supply	High dependence raises coercion exposure	Track strategic vulnerability over time
Supplier concentration	Dependence on a small number of exporters	Top supplier share / concentration ratio	Concentrated sourcing weakens resilience	Assess diversification needs
Chokepoint exposure	Reliance on key maritime routes or pipelines	Share of imports crossing major chokepoints	Disruption can trigger price and supply shocks	Support contingency planning
Revenue-risk exposure	Importance of fossil revenues in conflict-prone states	Hydrocarbon rents as % of GDP or exports	High rents can finance coercion or instability	Guide sanctions and external policy
Infrastructure vulnerability	Exposure of terminals, pipelines, grids and storage	Share of supply linked to critical assets	Centralised systems create single points of failure	Prioritise protection investment
Critical-minerals dependency	Exposure to concentrated clean-tech supply chains	Single-country processing share	Transition risk can create new dependencies	Inform industrial and recycling strategy

Table 14. Suggested indicators for monitoring fossil fuel security risk

V.8 Use of indicators in policy planning

The indicators should be used as a monitoring dashboard. They should be updated regularly and linked to policy decisions. A rising supplier concentration score should trigger diversification planning. Increasing chokepoint exposure should trigger maritime-risk assessment. High fossil revenue dependence in a partner country should trigger economic-diversification support. Weak infrastructure redundancy should trigger investment and emergency planning.

Indicators should also be used to assess whether policy is working. If fossil fuel demand falls but critical mineral dependence becomes highly concentrated, the transition may be reducing one vulnerability while creating another. If Russian fossil imports decline but shadow-fleet activity increases, sanctions enforcement may need strengthening. If renewable deployment increases but grid capacity lags, energy-security benefits may be delayed.

The framework should not be used mechanically. Numbers require interpretation. A country may show high import dependence but low coercion risk if suppliers are diversified, infrastructure is resilient and demand is flexible. Another country may have moderate import dependence but high risk because it relies on one hostile supplier or one vulnerable route.

The indicators are therefore most useful when combined with qualitative analysis, scenario planning and institutional judgement.

V.9 Data and reporting requirements

Effective monitoring requires reliable data. Governments and institutions should improve reporting on energy imports, supplier shares, route exposure, infrastructure concentration, emergency stocks, ownership structures, sanctions enforcement, fossil revenue flows and critical mineral supply chains.

Data should be collected from energy agencies, customs authorities, grid operators, port authorities, maritime trackers, financial intelligence units, sanctions authorities, environmental agencies, international organisations and private-sector operators.

Where security concerns limit disclosure, aggregated public reporting should still be provided. Public trust requires transparency. At the same time, detailed information about critical infrastructure, repair capacity and security vulnerabilities may need restricted handling.

The EU could develop an annual fossil fuel security-risk assessment as part of its Energy Union or economic-security reporting. NATO could include energy infrastructure and fossil dependency indicators in resilience assessments. Member States could produce national energy-security risk registers. Research organisations and civil society could provide independent monitoring.

V.10 Early-warning use

The indicators can also support early warning. Several warning signs should attract attention.

- A rapid increase in dependence on one supplier
- Declining storage levels before winter
- Rising insurance premiums on a major route
- Unusual tanker movements or ship-to-ship transfers
- Sudden interruptions to pipeline flows
- Cyber probing of energy infrastructure
- Political threats against energy supply
- Disinformation about shortages or prices
- Rising fossil fuel revenue in a sanctioned producer state
- Sharp fiscal deterioration in a fossil-exporting partner country
- Delays in grid expansion despite rising electrification
- Increasing concentration in critical mineral processing

None of these signs automatically indicates a crisis. Together, however, they may show rising vulnerability. A dashboard approach allows policymakers to detect patterns before disruption becomes severe.

V.11 Summary

This annex provides a practical set of indicators for monitoring fossil fuel security risk. It translates the White Paper's core argument into measurable categories.

The framework is built around six forms of exposure: import dependency, supplier concentration, chokepoint exposure, fossil revenue risk, infrastructure vulnerability and critical minerals dependency. These categories reflect the main ways in which fossil fuels and energy transition affect security.

The indicators should not be used to produce simplistic rankings. Their value lies in structured assessment, comparison over time and early warning. They can help governments, EU institutions, NATO, researchers and civil society identify where energy dependence is becoming coercible, where fossil revenue may support conflict, where infrastructure is fragile, and where transition may create new supply-chain risks.

A credible energy-security strategy should be able to answer three questions: what fossil fuel dependencies remain; which of them are strategically dangerous; and whether the transition is reducing vulnerability without creating new concentrations of risk. The indicators proposed in this annex provide a basis for answering those questions.

Annex VI. Bibliography

Exact bibliography prepared from the footnotes in Fossil Energy White Paper Working Document (12). Short-form repeat references have been expanded where the full source appears elsewhere in the notes. Entries marked unresolved are retained only as an audit list and should be corrected or removed before publication.

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