Iran Conflict
Supply Chain Impacts

Shared March 10, 2026

This brief provides a snapshot of current and potential supply chain impacts associated with the Iran conflict. The situation remains highly dynamic, and this document does not capture all possible effects as conditions continue to evolve.

Sections

Overview

The evolving conflict involving Iran represents both a shock event and a potential longer-term stressor for global supply chains. Some impacts — particularly those related to energy markets and shipping risk perceptions — can emerge almost immediately as markets react to new information. Other effects may take weeks or months to materialize, as supply chains adjust to disruptions, reroute shipments, draw down inventories, or seek alternative suppliers. The overall scale and duration of impacts will depend heavily on the length of disruptions in the Persian Gulf region and the responses of governments, markets, industry, and consumers.

Supply chains are simultaneously fluid and constrained. In many cases, commodities and raw materials are globally traded and can be substituted or sourced from multiple regions, allowing markets to adapt over time. However, other resources are tied to specific geographies, specialized infrastructure, or limited production capacity, which can constrain the speed and extent of substitution. Storage and buffering capacity also varies widely. Some commodities can be stockpiled and drawn down during disruptions, providing temporary resilience, while others operate in highly time-sensitive or just-in-time supply systems that are more sensitive to short-term interruptions.

Human behavior also plays a significant role in supply chain dynamics during periods of uncertainty. Panic buying, precautionary purchasing, and hoarding behaviors by individuals or organizations can create or intensify shortages that might otherwise have been manageable. These behavioral responses can amplify volatility in markets, transportation systems, and distribution networks.

Finally, supply chain disruptions rarely occur in isolation. As markets and logistics networks adapt, new trade patterns and sourcing arrangements may emerge. While these adjustments can restore supply, they may also shift vulnerabilities elsewhere, concentrating production, transportation, or storage in new locations and potentially increasing exposure to other hazards or disruptions.

The sections that follow examine several key supply chain considerations related to the Iran conflict, including energy production and export dynamics in the Persian Gulf region, the strategic importance of the Strait of Hormuz, price movements in global energy markets, and potential implications for other sectors that rely on commodities originating from or transiting through the region.

California's Fuel Dependency on Foreign Crude Oil

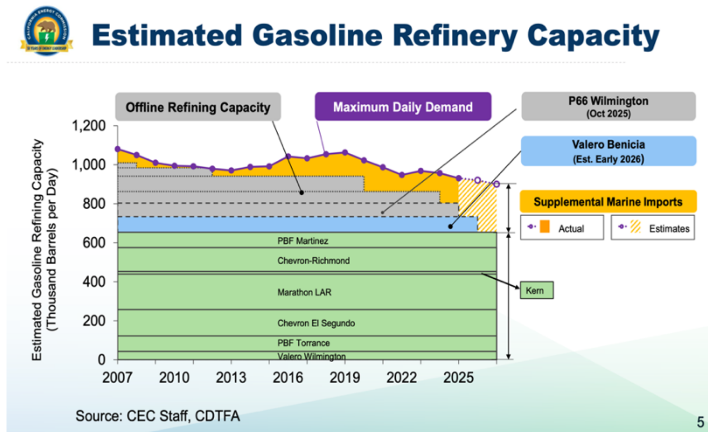
Due to its fairly high in-state production California had been fairly insulated from external fuel disruptions. Now with the closure of several refineries, dependency on marine imports of refined fuel is increasing.

A June 2025 letter from the California Energy Commission to the Governor, stated the California currently imports " about 10-20% of its gasoline from out-of-state and foreign sources, depending on refinery maintenance activities. Gasoline imports statewide could increase to 25-35% of demand by the summer of 2026, and up to 50% in the northern California region after the announced anticipated refinery closures, bringing risk of supply disruptions and price volatility." (Source: CEC, 2025)

California Fuel Flows and Estimated Gasoline Refinery Capacity

The December 8, 2025 California Energy Commission meeting included an update on California fuel flows and estimated gasoline refinery capacity. Refineries in California process 1.3 million barrels of crude oil each day – roughly 300,000 barrels of crude come from California and a million are imported – to produce roughly 700,000 barrels of CARB gasoline and another 100,000 barrels of non-CARB gasoline. About 1/3 of this capacity is in Northern California and 2/3 in Southern California. Because the state does not have any pipeline bringing fuel into the state, about 90% of California's gasoline comes from 8 in-state refineries with the remaining 10% imported by marine vessels.

In October 2025 the Phillips 66 Refinery in Wilmington (Southern California) closed and the Valerio Refinery in Benicia is expected to cease operations in early 2026. Marine imports are estimated to make up the supply difference.



Slide from December 8, 2025 CEC meeting. P66 Wilmington is the Philips 66 Wilmington Refinery that closed operations in October 2025 and Valero Benicia is Valero's refinery in Benicia expected to exit in early 2026.

California uses about 800,000 barrels (25 million gallons) of gasoline per day and exports 100,000 barrels to Nevada and Arizona.
Source: CEC, 12/8/25 Direct links to the meeting slide decks, supplemental material, and recording

Crude Oil Supply Sources for California Refineries

Refineries in California receive their crude oil a variety of sources:

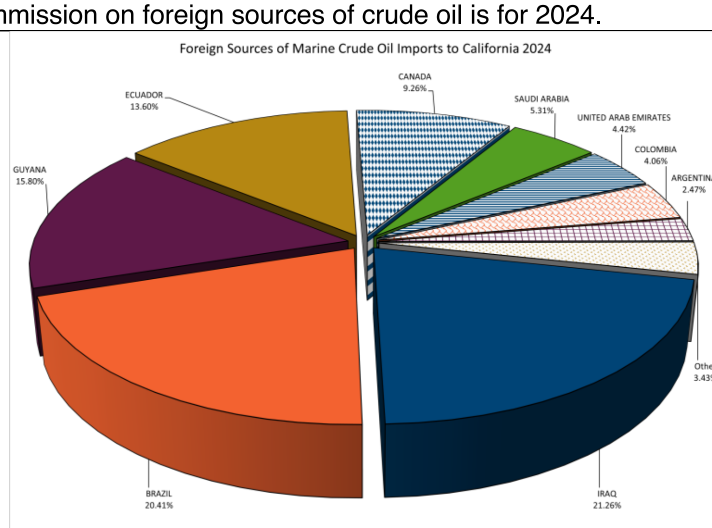
	Alaska Crude Oil	California Crude Oil*	Foreign Imports	Total
2025	16% (77,453k barrels)	22.9% (110,679k barrels)	61.1% (295,717k barrels)	483,849k barrels
2024	13.3% (67,879k barrels)	23.3% (118,733k barrels)	63.5% (324,037k barrels)	510,649k barrels
2023	15.9% (83,842k barrels)	23.4% (123,947k barrels)	60.7% (321,153k barrels)	528,942k barrels

* Includes minor amounts from North Dakota and Gulf Coast States. Note: rounding may mean percentages total to just over or under 100%. (Source: CEC - Monthly Oil Supply Sources to California Refineries)

Sources of Foreign Crude Oil (2024)

The latest data available from the California Energy Commission on foreign sources of crude oil is for 2024.

2024 Sources in Descending Order
Iraq - 21.26% (68,406k barrels)
Brazil - 20.41% (65,675k barrels)
Guyana - 15.80% (50,840k barrels)
Ecuador - 13.60% (43,766k barrels)
Canada - 9.26% (29,796k barrels)
Saudi Arabia - 5.31% (17,081k barrels)
United Arab Emirates - 4.42% (14,226k barrels)
Columbia - 4.06% (13,076k barrels)
Argentina - 2.47% (7,934k barrels)
Other Countries - 3.43% (11,031k barrels)



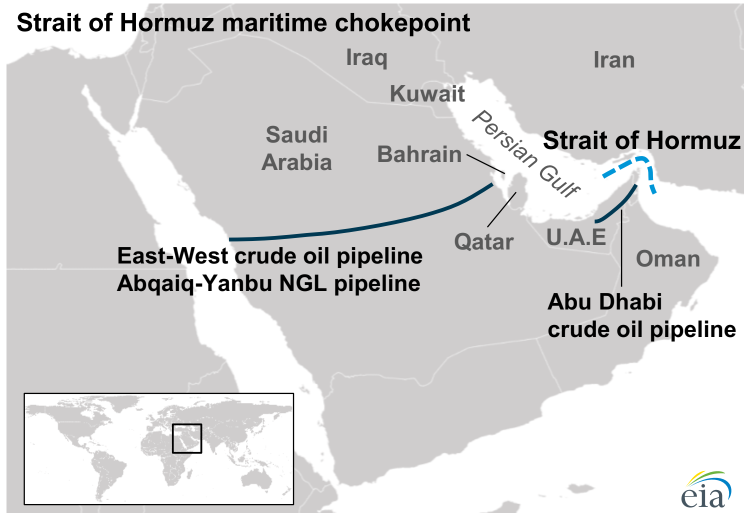
(Source: California Energy Commission, Foreign Sources of Crude Oil Imports to California, viewed March 9, 2026)

Strait of Hormuz

The Strait of Hormuz connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. It is located between Oman and Iran. (Source: EIA, 2025)

At its narrowest point, it is 22 nautical miles wide and falls within Iranian and Omani territorial waters. There are two shipping lanes through the Strait, one in each direction. Each is two miles wide and they are separated by a two-mile buffer. (Source: Congressional Research Service, 2025)

Roughly 27% of the world's crude oil and petroleum products maritime trade goes through the Strait, equating to about 20% of total world petroleum liquids consumption. Additionally, 22% of global liquefied natural gas (LNG) trade passes through the Strait. (Source: Congressional Research Service, 2025)



The US Energy Information Administration estimates that 84% of the crude oil and condensate and 83% of the liquefied natural gas that moved through the Strait of Hormuz went to Asian markets in 2024. China, India, Japan, and South Korea were the top destinations for crude oil moving through the Strait of Hormuz to Asia, accounting for a combined 69% of all Hormuz crude oil and condensate flows in 2024. These markets would likely be most affected by supply disruptions at Hormuz. (Source: EIA, 2025)

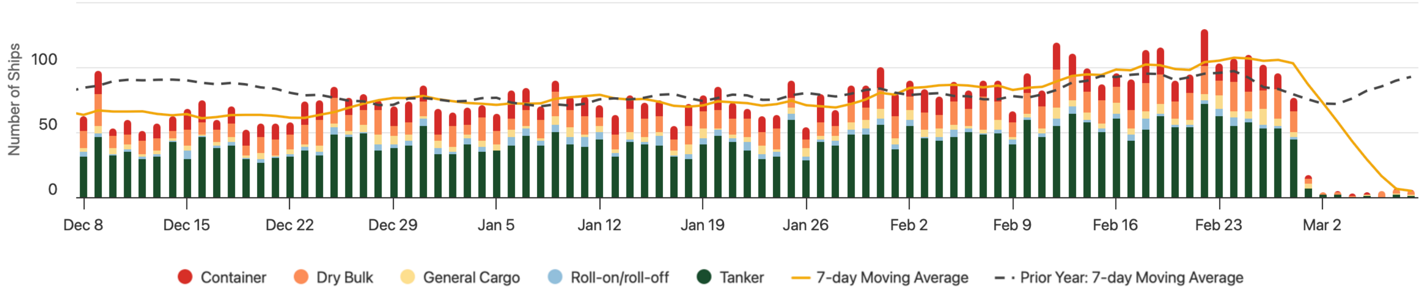
Saudi Arabia and the UAE have some infrastructure in place that can bypass the Strait of Hormuz, which may somewhat mitigate any transit disruptions through the strait. The pipelines do not typically operate at full capacity, and we estimate that about 2.6 million b/d of capacity from the Saudi and UAE pipelines could be available to bypass the Strait of Hormuz in the event of a supply disruption. Saudi Aramco operates the 5 million-b/d East-West crude oil pipeline, which runs from the Abqaiq oil processing center near the Persian Gulf to the Yanbu port on the Red Sea. Aramco temporarily expanded the pipeline's capacity to 7.0 million b/d in 2019 when it converted some natural gas liquids pipelines to accept crude oil. In 2024, Saudi Arabia pumped more crude oil through the East-West pipeline to avoid the shipping disruptions around the Bab al-Mandeb. The UAE also operates a pipeline that bypasses the Strait of Hormuz. This 1.8 million-b/d pipeline links onshore oil fields to the Fujairah export terminal in the Gulf of Oman. In 2024, crude oil and condensate volumes originating in the UAE and traversing Hormuz were 0.4 million b/d less than in 2022 because refinery upgrades allowed more heavy crude oil to be refined locally. These upgrades also allowed the UAE to increase exports of its lighter crude oil grades, and use of the pipeline to the Fujairah export terminal increased. Increased use of the pipeline for day-to-day operations has limited the excess capacity available to reroute additional volumes around the Strait of Hormuz. Iran inaugurated the Goreh-Jask pipeline and the Jask export terminal on the Gulf of Oman (avoiding the Strait of Hormuz) with a single export cargo in July 2021. The pipeline's effective capacity remains around 300,000 b/d. However, during the summer of 2024 Iran exported less than 70,000 b/d from ports (Bandar-e-Jask and Kooh Mobarak) using the Goreh-Jask pipeline and stopped loading cargoes after September 2024. (Source: EIA, 2025)

The Strait of Hormuz is a key transit point for global oil and natural gas markets. The narrowness of the Strait, lack of alternative seaborne routes, limited land-based bypass capacity, and historical vulnerabilities during conflicts have made it a prominent chokepoint for oil and natural gas shipping. It would be challenging to replace volumes of both commodities if the Strait were closed, particularly in the short term. (Source: Congressional Research Service, 2025)

Iran has the military capacity—using mines, speed boats, submarines, shore-based cruise missiles, aircraft, and other systems—to disrupt the flow of commercial shipping into and out of the Persian Gulf. There also appears to be a consensus that the U.S. military has the capacity to counter Iran's forces and restore the flow of shipping, if necessary. However, such an effort would likely take some time—days, weeks, or perhaps months—particularly if a large number of Iranian mines needed to be cleared from the Gulf. (Source: Congressional Research Service, 2025)

Ship Traffic

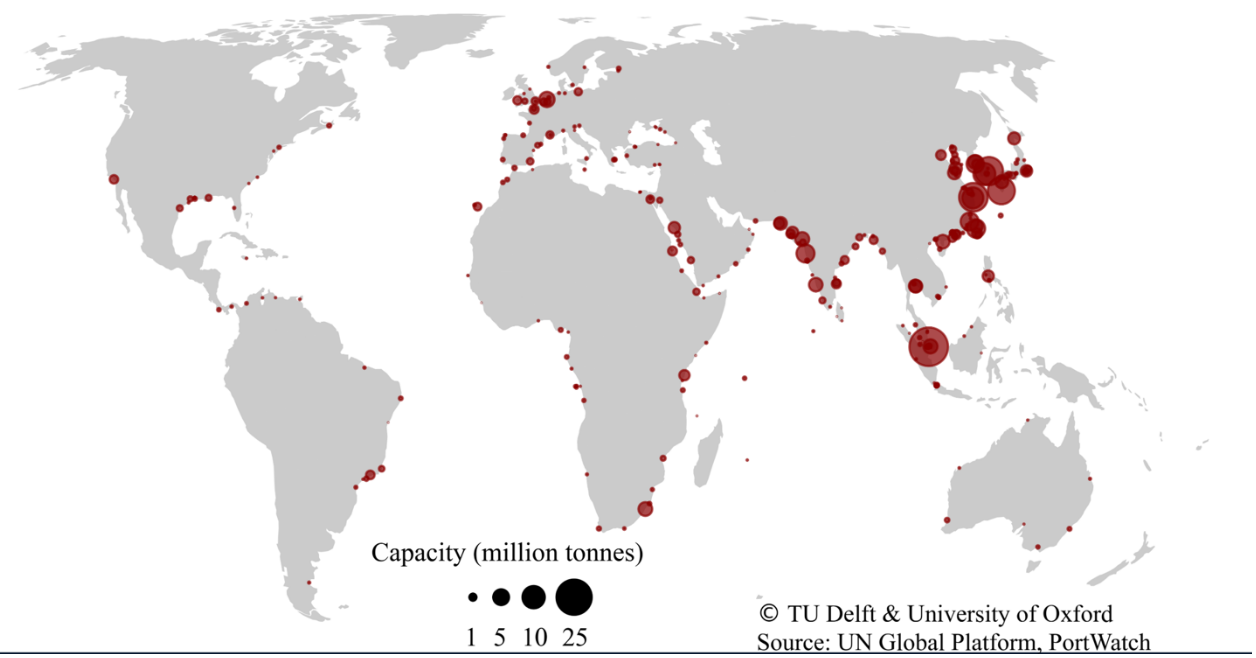
International Monetary Fund's Port Monitor tracks transit calls through global maritime chokepoints. Below is the data for the Strait of Hormuz – December 8, 2025 through March 8, 2026.



Source: IMF Port Monitor, viewed 3/10/26

Monthly Port-level Traffic Flows at Risk from Trade Disruption in the Strait of Hormuz

Map shows the volume of tanker traffic flows at risk of being affected by the recent disruptions to shipping in the Strait of Hormuz. Affected traffic flow is tracked for each port visited after transiting the Strait of Hormuz. These estimates are based on AIS data.



Source: IMF Port Monitor, viewed 3/10/26

Persian Gulf Region Oil Production and Export

Oil production, trade, and refining in the Middle East are critically important for global oil markets. The region hosts more than 30% of world crude oil production, more than 90% of standby crude oil production capacity, and approximately 11% of refining capacity. Further, more than 40% of global crude oil exports and more than 20% of oil product exports depart from countries located in the broader Middle East region. (Source: Congressional Research Service, 2025)

more than 90% of spare production capacity is located in Middle East countries that export crude oil through the Strait, thereby limiting the effectiveness of this standby source of supply to address oil trade disruptions in the region. (Source: Congressional Research Service, 2025)

Most of these oil exports are loaded in the Gulf and transit the Strait of Hormuz for delivery to buyers in Asia, including China, India, South Korea, and Japan. However, oil supply disruptions in the Middle East region could affect oil prices throughout the world, including crude oil and gasoline prices in the United States. The magnitude of actual price effects, and the resulting impacts on inflation and broader economic conditions, would be a function of the size and duration of an actual supply disruption; the ability to reroute oil exports from the region; and the ability of spare production capacity, emergency response measures, and commercial inventories elsewhere to compensate for Middle East supply losses. (Source: Congressional Research Service, 2025)

A prolonged disruption of Middle East oil trade would create oil market conditions for which there is no historical precedent. The efficacy of emergency response measures could be tested up to their design limits. Oil prices would likely experience significant upward price pressure. Exactly how high and for how long prices might be elevated is uncertain and would be determined by the amount of time needed to normalize Middle East oil trade. (Source: Congressional Research Service, 2025)

Persian Gulf Region Natural Gas Production & Export

Although natural gas is more of a local or regional commodity than oil, with 72% of natural gas being consumed in the country that produced it, natural gas has been moving toward becoming a more global commodity like oil. Trade in natural gas is almost evenly split between exports by pipeline (52%) and as liquefied natural gas (LNG). The entry of the United States as an LNG exporter, beginning in 2016, from the lower 48 states changed the way LNG is bought, sold, and priced around the world. (Source: Congressional Research Service, 2025)

During past conflicts in which the shipment of energy products was at risk, the main focus was the oil market, with minor consideration for natural gas. However, over the last few years, geopolitical events—such as Russia's invasion of Ukraine—have highlighted the importance of natural gas in the global economy. Approximately 22% of the world's LNG exports need to transit the Strait, primarily from Qatar and the United Arab Emirates (UAE). Most Qatari exports are destined for Asian markets, including China (24%). (Source: Congressional Research Service, 2025)

An important consideration for natural gas, should the Strait be closed in some way, is that most major gas-consuming countries do not have a strategic natural gas reserve in the same way they have a strategic reserve for oil. A decrease in the flow of natural gas could not be mitigated by a release from a strategic natural gas reserve. Output could be increased from liquefaction plants at LNG terminals outside of the Persian Gulf, but most LNG terminals already operate at a very high percent of capacity because of the cost of construction. (Source: Congressional Research Service, 2025)

Individual Country Information (Oil & Natural Gas)

Kuwait

- Kuwait was the fourth-largest crude oil producer in OPEC, and its crude oil and lease condensate production ranked 10th in the world. Kuwait exported most of its crude oil and condensate production in 2022. Crude oil export revenues account for a large part of Kuwait's economy. The fields in the southeast, mainly from the legacy Burgan field, account for most of Kuwait's oil production and exports, which consist of a medium, sour crude oil grade (higher sulfur content). Kuwait added two grades from the northern region to its portfolio of crude oil export grades starting in 2018. Kuwait began exporting its super light oil grade from the Jurassic oil and natural gas field in mid-2018 and its heavy crude oil grade from the south Ratqa and Umm Naqa fields in early 2020. (Source: EIA – Kuwait)
- Although Kuwait's estimated proved natural gas reserves were low compared with its neighbors in the Middle East, it ranked in the top 20 countries in the world. (Source: EIA – Kuwait)

Iran

- Iran was the fourth-largest crude oil producer in OPEC in 2023 and the third-largest dry natural gas producer in the world in 2022. It holds some of the world's largest deposits of proved oil and natural gas reserves, ranking as the world's third-largest oil reserve holder the world's second-largest natural gas reserve holder in 2023. At the end of 2023, Iran accounted for 24% of oil reserves in the Middle East and 12% in the world. Although Iran is a member of OPEC, it is exempt from the production cuts under the OPEC+ agreement because its crude oil production is constrained as a result of sanctions. (Source: EIA – Iran)
- Iran's economy is relatively diversified compared with many other Middle Eastern countries, but petroleum and other liquids exports are a significant source of government revenue. (Source: EIA – Iran)

Iraq

- Iraq (Federal Iraq and Kurdistan Regional Government) was the second-highest crude oil producer in OPEC after Saudi Arabia and the seventh-highest total petroleum liquids producer in the world in 2024. Most of Iraq's crude oil reserves are located in the southern Basra region, the Diyala region east of Baghdad, and the northeastern Kirkuk region. Crude oil export revenues account for a large part of Iraq's economy. (Source: EIA – Iraq)
- At 131 trillion cubic feet (Tcf), Iraq's proved natural gas reserves in 2023 accounted for 2% of global reserves and 4% of Middle East reserves. Most of Iraq's natural gas reserves are associated with oil, and most of the associated natural gas is in large oil fields in southern Iraq. (Source: EIA – Iraq)

Qatar

- One of OPEC's longest-standing members, Qatar left the organization in January 2019 to shift resources and investment from oil production to natural gas and liquefied natural gas (LNG) infrastructure projects. (Source: EIA – Qatar)
- Qatar was the world's sixth-largest dry natural gas producer and the third-largest natural gas exporter in 2024. Qatar's high natural gas output yields significant volumes of valuable petroleum liquid byproducts, such as lease condensates and hydrocarbon gas liquids (HGLs). Qatar is also at the forefront of gas-to-liquids (GTL) production, and is home to the world's largest GTL facility. Its two GTL facilities can convert natural gas to 174,000 b/d of petroleum products and 120,000 b/d of hydrocarbon gas liquids such as ethane and propane. (Source: EIA – Qatar)

Saudi Arabia

- World's third-highest crude oil and condensate producer, the world's top crude oil exporter, and OPEC's top crude oil (2023 data). Saudi Arabia produces five grades of crude oil: Arabian Heavy, Arabian Medium, Arabian Light, Arabian Extra Light, and Arabian Super Light. In general, the majority of Saudi Arabia's crude oil is considered sour because its sulfur content is greater than 1%. (Source: EIA – Saudi Arabia)
- Saudi Arabia held an estimated 17% of the world's proved oil reserves and 22% of OPEC's proved reserves in 2023, according to OPEC data. Saudi Arabia's reserves include Ghawar and Safaniya, the world's largest onshore and offshore oil fields, respectively. (Source: EIA – Saudi Arabia)
- Asia is Saudi Arabia's primary export market for crude oil, receiving 75% of Saudi Arabia's total annual crude oil exports in 2023. China, Japan, South Korea, and India were its top crude oil importers. (Source: EIA – Saudi Arabia)
- Saudi Arabia holds the world's sixth-largest proved natural gas reserves after Russia, Iran, Qatar, the United States, and Turkmenistan. (Source: EIA – Saudi Arabia)

United Arab Emirates

- The United Arab Emirates (UAE) was the seventh-largest total liquid fuels producer in the world in 2022 and the third largest in the Organization of Petroleum Exporting Countries (OPEC). The UAE produces a variety of different crude oil grades; its two main export grades are Murban and Upper Zakum, which are light, relatively sour crude oil grades. Some of the UAE's crude oil grades are included in the collection (or basket) of crude oil grades that make up the Dubai/Oman benchmark, an international price marker for medium, sour crude oil from the Middle East. (Source: EIA – UAE)
- Although the UAE exports natural gas in the form of liquefied natural gas (LNG), it is a net importer of natural gas because domestic natural gas consumption exceeds production. The UAE relies on natural gas imports via pipeline or as LNG from other countries, primarily Qatar, to meet its domestic consumption needs. (Source: EIA – UAE)

Price Movements

Crude Oil

The Brent crude oil spot price has risen sharply following the onset of military action in the Middle East. Brent settled at $94 per barrel (b) on March 9, up about 50% from the beginning of the year and the highest since September 2023. Crude oil prices have risen as petroleum shipments through the Strait of Hormuz have fallen, and some Middle East oil production has been shut in. (Source: EIA, 3/10/26)

High uncertainty about the conflict's effect on oil supplies has added a large risk premium to oil prices as market participants assess actual disruptions to oil flows and weigh the potential for those disruptions to persist. (Source: EIA, 3/10/26)

The primary risk that would cause oil prices to continue rising is an extended closure of the Strait of Hormuz. Although the Strait of Hormuz is not physically blocked, the threat of attack by Iran and the cancellation of insurance coverage have led most tankers to avoid transiting the Strait. As a result, some oil production in the region has been shut in. If this reduction in vessel volume persists, oil storage behind the chokepoint will quickly fill, causing oil producers to shut in even more production, lending further support to oil prices. (Source: EIA, 3/10/26)

Natural Gas

Reductions in the flow of liquified natural gas (LNG) through the Strait of Hormuz have caused natural gas prices in Europe and Asia to increase. However, we expect U.S. natural gas prices to be relatively unaffected by this development, as LNG export facilities were already operating at a high level of utilization prior to the Middle East conflict, limiting the ability to export additional volumes in the near term. Most of the flexibility in exports will be in the ramp-up at Corpus Christi State 3 (Train 5), which was completed in February and at Golden Pass Train 1, which is set to come online this month. (Source: EIA, 3/10/26)

Mineral Commodities from the Region

Per the USGS's 2026 Mineral Commodities Summary, the following are mineral commodities for which the US has a net import reliance and one or more of the leading import sources was a Persian Gulf and surrounding country. *Mineral Commodities with an asterisk (*) are on the US's list of critical mineral commodities.*

Mineral Commodity	Leading Import Sources (2021-2024)	US Import Reliance
*Titanium, sponge metal	Japan (77%), **Saudi Arabia** (13%), Kazakhstan (8%)	100%
Gemstones	India, **Israel**, Belgium, South Africa	99%
*Potash	Canada (79%), Russia (12%), **Israel** (3%)	92%
*Silver	Mexico (47%), Canada (18%), Chile (5%), **Turkey** (5%)	77%
Bauxite	Jamaica (60%), **Turkey** (16%), Guyana (9%), Australia (8%)	> 75%
*Magnesium Metal	Combined Total: **Israel** (20%); Canada (15%); **Turkey** (11%); Czechia (9%) *Magnesium metal (99.8% purity): Israel (47%); Turkey (31%); Russia (8%); China, 6%* *Magnesium alloys (magnesium content): Czechia (26%); South Korea (20%); Israel (11%); Taiwan (11%)* *Sheet, powder, and other (magnesium content): Mexico (30%); Austria (23%); China (17%); Taiwan (9%);* *Scrap: Canada (36%); Mexico (15%); China (14%); India (8%)*	> 75%
*Aluminum	Canada (56%); **United Arab Emirates** (8%); **Bahrain** (4%); China (3%)	60%
*Magnesium Compounds	Total imports: China (58%); Brazil (8%); Canada (8%); **Israel** (8%) *Caustic-calcined magnesia: China (74%); Canada (21%)* *Crude magnesite: China (91%); Japan (5%)* *Dead-burned and fused magnesia: China (69%); Brazil (17%)* *Magnesium chloride: **Israel** (56%); Netherlands (21%); Austria (7%)* *Magnesium hydroxide: Mexico (61%); Netherlands (14%); **Israel** (13%)* *Magnesium sulfates: China (53%); Germany (12%); India (11%); Mexico (7%)*	59%
Bromine	**Israel** (83%), **Jordan** (12%), China (3%)	< 25%
Talc	**Pakistan** (52%), Canada (24%), China (12%)	22%
Cement	**Turkey** (32%), Canada (20%), Vietnam (13%), Greece (9%)	21%

Source: USGS, 2026

Aluminum

- **US Production:** In 2025, three companies operated six primary aluminum smelters in five States. Two of these smelters operated at full capacity throughout the year, whereas two smelters operated at reduced capacity. Estimated primary production and secondary production from new and old scrap both decreased slightly from that in 2024. (Source: USGS, 2026)
- **Domestic Uses:** Transportation applications accounted for 36% of domestic consumption; the remainder was used in packaging, 24%; building, 13%; electrical, 9%; consumer durables and machinery, 8% each; and other, 2%. (Source: USGS, 2026)
- **Global Primary Smelter Capacity** (2025 estimated), in metric tons (listed in descending order): China (45,000,000), India (4,200,000), Russia (3,900,000), Canada (3,300,000), United Arab Emirates (2,700,000), Bahrain (1,600,000), Australia (1,500,000), Norway (1,300,000), Brazil (1,200,000), Malaysia (1,100,000), Iceland (750,000), United States (660,000); all other countries (7,000,000). Secondary scrap production capacity is not included – The US has additional 1,600 production capacity from old scrap and 2,000 for new scrap.
- **US Imports:** In 2025 the US imported 4,400,000 metric tons of crude and semi-fabricated products and 890,000 metric tons of scrap. (Source: USGS, 2026)
- **Substitutes:** Composites can substitute for aluminum in aircraft fuselages and wings. Glass, paper, plastics, and steel can substitute for aluminum in packaging. Composites, magnesium, steel, and titanium can substitute for aluminum in ground transportation uses. Composites, steel, vinyl, and wood can substitute for aluminum in construction. Copper can replace aluminum in electrical and heat-exchange applications. (Source: USGS, 2026)

Bauxite

- **US Production and Consumption:** In 2025, a limited amount of bauxite and bauxitic clay was produced for nonmetallurgical use in Alabama, Arkansas, and Georgia. In 2025, the reported quantity of bauxite consumed was estimated to be 1.7 million tons, 4% more than that reported in 2024. (Source: USGS, 2026)
- **Domestic Uses:** An estimated 63% of the bauxite consumed was refined by the Bayer process for alumina or aluminum hydroxide, and the remainder went to products such as abrasives, cement, chemicals, proppants, and refractories, and as a slag adjuster in steel mills. (Source: USGS, 2026)
- **Global Production Capacity** (2025 estimated), in metric dry tons (listed in descending order): Guinea (150,000,000), Australia (97,000,000), China (87,000,000), Brazil (33,000,000), India (25,000,000), Indonesia (10,000,000), Jamacia (6,200,000), Russia (5,700,000), Saudi Arabia (5,700,000), Kazakhstan (4,800,000), Turkey (3,800,000), Vietnam (3,800,000), Greece (960,000), United States (data withheld), and all other countries (8,000,000). (Source: USGS, 2026)
- **US Imports:** In 2025, the US imported an estimated 3,000,000 metric dry tones of bauxite. (Source: USGS, 2026)
- **Substitutes:** Bauxite is the only raw material used in the production of alumina on a commercial scale in the United States. (Source: USGS, 2026)

Bromine

- **US Production:** Bromine was recovered from underground brines by two companies in Arkansas. The two bromine companies in the United States account for a large percentage of world production capacity. (Source: USGS, 2026)
- **Uses:** The leading global applications of bromine are for the production of brominated flame retardants (BFRs) and clear brine drilling fluids. Bromine compounds also are used in a variety of other applications, including industrial uses, as intermediates, and for water treatment. (Source: USGS, 2026)
- **Global Production Capacity** (2025 estimated), in metric tons (listed in descending order): Israel (200,000), Jordan (110,000), China (90,000), Japan (20,000), India (7,000), Ukraine (6,000), United States (data withheld) (Source: USGS, 2026)
  - Bromine is found principally in seawater, evaporitic (salt) lakes, and underground brines associated with petroleum deposits. Seawater contains about 65 parts per million bromine, or an estimated 100 trillion tons. The Dead Sea, in the Middle East, is estimated to contain 1 billion tons of bromine. Bromine also is recovered from seawater as a coproduct during evaporation to produce salt. (Source: USGS, 2026)
- **US Imports:** In 2025 the US imported an estimated 40,000 metric tons of bromine. In 2025, estimated total imports of bromine and bromine compounds (bromine content) decreased by about 30% from those in 2024. (Source: USGS, 2026)
- **Substitutes:** Chlorine and iodine may be substituted for bromine in a few chemical reactions and for sanitation purposes. There are no comparable substitutes for bromine in various oil- and gas-well-completion and packer applications. (Source: USGS, 2026)

Cement

- **US Production:** In 2025, U.S. portland and blended cement production decreased to an estimated 82 million tons from an estimated 83 million tons, and masonry cement production decreased by 2.7% to an estimated 2.1 million tons. Cement was produced at 97 plants in 34 States and in Puerto Rico. Texas, Missouri, California, and Florida were, in descending order of output, the four leading cement-producing States and accounted for approximately 44% of the U.S. total. (Source: USGS, 2026)
- **Domestic Uses:** In 2025, an estimated 70% to 75% of sales were to ready-mixed concrete producers, 11% to concrete product manufacturers, 8% to 10% to contractors, and 5% to 10% to other customer types. The estimated consumption for 2025 in the US is 110,000,000 metric tons. (Source: USGS, 2026)
- **Global Cement Production Capacity** (2025 estimated), in metric tons (listed in descending order): China (1,700,000,000), India (470,000,000), Vietnam (100,000,000), Turkey (89,000,000), United States (84,000,000), Iran (68,000,000), Brazil (67,000,000), Egypt (64,000,000), Indonesia (64,000,000), Russia (59,000,000), Saudi Arabia (54,000,000), Japan (44,000,000), Mexico (42,000,000), South Korea (37,000,000), and all other countries (860,000,000) (Source: USGS, 2026)
- **Global Clinker Capacity** (2025 estimated), in metric tons (listed in descending order): China (1,800,000,000), India (400,000,000), Vietnam (110,000,000), Turkey (100,000,000), United States (100,000,000), Iran (85,000,000), Indonesia (83,000,000), Russia (80,000,000), Egypt (75,000,000), Saudi Arabia (75,000,000), South Korea (62,000,000), Brazil (61,000,000), Japan (50,000,000), Mexico (42,000,000), and all other countries (650,000,000) (Source: USGS, 2026)

- **US Imports:** In 2025 the US imported 23,000,000 metric tons of hydraulic cement and 660,000 metric tons of clinker cement. (Source: USGS, 2026)
- **Substitutes:** Most portland cement is used to make concrete, mortars, or stuccos, and competes in the construction sector with concrete substitutes, such as aluminum, asphalt, clay brick, fiberglass, glass, gypsum (plaster), steel, stone, and wood. Certain materials, especially fly ash and ground granulated blast furnace slag, develop good hydraulic cementitious properties by reacting with lime, such as that released by the hydration of portland cement. (Source: USGS, 2026)

Magnesium Compounds

- **US Production:** In 2025, most U.S. magnesium compounds were produced from seawater and natural brines. Magnesium compounds were recovered from seawater by one company in California and another company in Delaware, from well brines by one company in Michigan, and from lake brines by two companies in Utah. Magnesite was mined by one company in Nevada. (Source: USGS, 2026)
- **Domestic Uses:** In 2025 about 78% of magnesium compounds were consumed in the form of caustic-calcined magnesia, magnesium chloride, magnesium hydroxide, and magnesium sulfates across the following industries and uses, in descending order of quantity, environmental, deicing, chemical, and agricultural. The remaining magnesium compounds were consumed for refractories in the form of dead-burned magnesia, fused magnesia, and olivine. In 2025 the US used an estimated 980,000 metric tons of magnesium compounds. (Source: USGS, 2026)
- **Global Mine Production** (2025 estimated), in metric tons (listed in descending order): China (12,700,000), Brazil (1,800,000), Russia (1,700,000), Turkey (1,600,000), Austria (650,000), Spain (640,000), Australia (400,000), Slovakia (330,000), Canada (230,000), Iran (200,000), Greece (130,000), India (85,000), United States (data withheld), and all other countries (340,000). Resources from which magnesium compounds can be recovered range from large to virtually unlimited and are globally widespread. (Source: USGS, 2026)
- **US Imports:** In 2025 the US imported an estimated 640,000 metric tons of magnesium compounds. (Source: USGS, 2026)
- **Substitutes:** Alumina, chromite, and silica substitute for magnesia in some refractory applications. (Source: USGS, 2026)

Magnesium Metal

- **US Production:** One company in Utah had a smelter to recover primary magnesium from brines from the Great Salt Lake in Utah by an electrolytic process but production was reported to have stopped in 2022. Secondary magnesium was recovered from scrap at smelters that produced magnesium ingot and castings and from aluminum alloy scrap at secondary aluminum smelters. In September 2025, the operator of the only U.S. primary magnesium smelter located in Utah filed for Chapter 11 bankruptcy protection. (Source: USGS, 2026)
- **Domestic Uses:** In 2025, an estimated 69% of primary magnesium consumption was used in castings, principally for the automotive industry. Aluminum-base alloys that were used for packaging, transportation, and other applications accounted for an estimated 15% of consumption; desulfurization of iron and steel, 9%; and all other uses, 7%. About 58% of secondary magnesium was estimated to be used in aluminum alloys, and about 42% was consumed for structural uses. (Source: USGS, 2026)
- **Global Primary Smelter Production and Capacity** (2025 estimated), in metric tons (listed in descending order): China (950,000, capacity estimated at 1,480), Russia (60,000, capacity estimated at 81,000), Brazil (20,000, capacity estimated at 22,000), Israel (20,000, capacity reported to be 34,000), Turkey (15,000, this is at reported capacity), Kazakhstan (13,000, capacity estimated at 21,000), Iran (5,000, capacity estimated at 6,000), United States (no production reported in 2025, but capacity reported at 64,000), and estimated capacity for all other counties (42,000) (Source: USGS, 2026)
- **US Imports:** In 2025 the US imported an estimated 82,000 metric tons of magnesium metal. (Source: USGS, 2026)
- **Substitutes:** Aluminum and zinc may substitute for magnesium in castings and wrought products. The relatively light weight of magnesium is an advantage over aluminum and zinc in castings and wrought products in most applications; however, its high cost is a disadvantage relative to these substitutes. For iron and steel desulfurization, calcium carbide may be used instead of magnesium. Magnesium is preferred to calcium carbide for desulfurization of iron and steel because calcium carbide produces acetylene in the presence of water. (Source: USGS, 2026)

Potash

- **US Production:** The majority of U.S. production was from southeastern New Mexico, where two companies operated two underground mines and one deep-well solution mine. In Utah, two companies operated three facilities. (Source: USGS, 2026)
- **Domestic Uses:** Potash denotes a variety of mined and manufactured salts that contain the element potassium in water-soluble form. In agriculture, the term potash refers to potassic fertilizers, which are potassium chloride (KCl), SOP, and potassium magnesium sulfate (SOPM) or langbeinite. Muriate of potash (MOP) is an agriculturally acceptable mix of KCl (95% pure or greater) and sodium chloride for fertilizer use. The fertilizer industry used about 85% of U.S. potash sales, and the remainder was used for chemical and industrial applications. More than 60% of the potash produced was SOPM and SOP, which are required to fertilize certain chloride-sensitive crops. The remainder of production was MOP and was used for agricultural and chemical applications. In 2025 the US consumption is estimated at 5,900,000 metric tons. (Source: USGS, 2026)
- **Global Mine Production** (2025 estimated), in metric tons (listed in descending order): Canada (15,000,000), Russia (10,000,000), China (6,300,000), Belarus (6,000,000), Germany (3,000,000), Laos (2,400,000), Israel (2,000,000), Jordan (1,800,000), Chile (600,000), United States (500,000), Spain (450,000), Brazil (300,000), and all other countries (350,000) (Source: USGS, 2026)
- **US Imports:** In 2025 the US imported an estimated 5,600,000 metric tons of potash. (Source: USGS, 2026)
- **Substitutes:** No substitutes exist for potassium as an essential plant nutrient and as an essential nutritional requirement for animals and humans. Manure and glauconite (greensand) are low-potassium-content materials that can be profitably transported only short distances to crop fields. Glauconite is used as a potassium source for organic farming. (Source: USGS, 2026)

Silver

- **US Production:** In 2025, U.S. mines produced approximately 1,100 tons of silver. Silver was produced at 4 silver mines and as a byproduct or coproduct from 31 domestic base- and precious-metal operations. Silver was produced in 12 States; Alaska continued as the country's leading silver-producing State, followed by Nevada. There were 24 U.S. refiners that reported production of commercial-grade silver with an estimated total output of 2,100 tons from domestic and foreign ores and concentrates and from new and old scrap. (Source: USGS, 2026)
- **Domestic Uses:** The physical properties of silver include high ductility, electrical conductivity, malleability, and reflectivity. In 2025, the estimated domestic uses for silver were in electrical and electronics, 25%; other industrial uses and photography, 19%; net physical investment (bars), 18%; photovoltaics (PV), 15%; coins and medals, 14%; jewelry and silverware, 6%; and brazing and solder, 3%. Other applications for silver include use in antimicrobial bandages, clothing, pharmaceuticals, and plastics; batteries; bearings; brazing and soldering; catalytic converters in automobiles; electroplating; inks; mirrors; photography; photovoltaic solar cells; water purification; wood treatment; and processing of spent ethylene oxide catalysts. In 2025 the estimated consumption (use) of silver in the US was 9,400 metric tons. (Source: USGS, 2026)
- **Global Mine Production** (2025 estimated), in metric tons (listed in descending order): Mexico (6,300), Peru (3,600), China (3,400), Bolivia (1,500), Chile (1,400), Poland (1,300), Russia (1,200), United States (1,100), Australia (1,000), Argentina (800), India (800), Kazakhstan (630), Canada (400), Sweden (400), and all other countries (2,100) (Source: USGS, 2026)
- **US Imports:** In 2025 the US is estimated to have imported 7,600 metric tons of silver) (Source: USGS, 2026)
- **Substitutes:** Digital imaging, film with reduced silver content, silverless black-and-white film, and xerography substitute for traditional photographic applications for silver. Surgical pins and plates may be made with stainless steel, tantalum, and titanium in place of silver. Stainless steel may be substituted for silver flatware. Nonsilver batteries may replace silver batteries in some applications. Aluminum and rhodium may be used to replace silver that was traditionally used in mirrors and other reflecting surfaces. Silver may be used to replace more costly metals in catalytic converters for off-road vehicles. (Source: USGS, 2026)

Talc

- **US Production:** Three companies operated five talc-producing mines in three States during 2025. Talc was mined in Montana, Texas, and Vermont. (Source: USGS, 2026)
- **Domestic Uses:** Talc produced and sold in the United States was used in plastics, 36%; paint, 19%; ceramics (including automotive catalytic converters), 17%; paper, 12%; roofing, 8%; and rubber, 2%. The remaining 6% was for agriculture, cosmetics, export, insecticides, and other miscellaneous uses. In 2025 the estimated consumption of talc in the US was 600,000 metric tons. (Source: USGS, 2026)
- **Global Mine Production** (2025 estimated), in metric tons (listed in descending order): India (1,500,000), China

(1,300,000), Brazil (570,000), United States (490,000), France (300,000), South Africa (300,000), South Kora (300,000), Turkey (300,000), Afghanistan (200,000), Finland (200,000), Pakistan (200,000), Italy (170,000), Canada (150,000), Japan (130,000), and all other countries (790,000). (Source: USGS, 2026)

- **US Imports:** In 2025 the US is estimated to have imported 260,000 metric tons of talc. Imports of talc and related materials were estimated to have increased by 12% in 2025 compared with those in 2024. Imports from Pakistan decreased by about 9% in 2025 and accounted for about 49% of total imports. Imports from Canada decreased by 21% and accounted for 20% of the total. Imports from China increased by approximately 125% and accounted for approximately 27% of total imports. The United States is self-sufficient in most grades of talc and related minerals, but lower priced imports have replaced domestic sources for some uses. (Source: USGS, 2026)
- **Substitutes:** Substitutes for talc include bentonite, chlorite, feldspar, kaolin, and pyrophyllite in ceramics; chlorite, kaolin, and mica in paint; calcium carbonate and kaolin in paper; bentonite, kaolin, mica, and wollastonite in plastics; and kaolin and mica in rubber. (Source: USGS, 2026)

Titanium, sponge metal

- **US Production:** The United States did not produce titanium sponge metal in 2025. The last domestic
- sponge plant closed in 2024. The facility was in Utah and had an estimated capacity of 500 tons per year of sponge that was further refined for use in electronics. A second sponge facility in Henderson, NV, with an estimated capacity of 12,600 tons per year has been idled since 2020 owing to market conditions. A third facility in Rowley, UT, with an estimated capacity of 10,900 tons per year has remained idle since 2016. (Source: USGS, 2026)
- **Domestic Uses:** The majority of titanium metal was used in aerospace applications, and the remainder was used in armor, chemical processing, marine hardware, medical implants, power generation, and other applications. In 2025 the US is estimated to have consumed 44,000 metric tons. (Source: USGS, 2026)
- **Global Production and Capacity** (2025 estimated), in metric tons (listed in descending order of production): China (260,000, capacity estimated at 320,000), Japan (53,000, capacity estimated at 65,200), Russia (25,000, capacity estimated at 46,500), Kazakhstan (16,000, capacity estimated at 26,000), Saudi Arabia (12,000, capacity estimated at 15,600), and India (300, capacity estimated at 500) (Source: USGS, 2026)
- **US Imports:** In 2025 the US imported 44,000 metric tons of titanium sponge metal. (Source: USGS, 2026)
- **Substitutes:** Few materials possess titanium metal's strength-to-weight ratio and corrosion resistance. In high-strength applications, titanium competes with aluminum, composites, intermetallics, steel, and superalloys. Aluminum, nickel, specialty steels, and zirconium alloys may be substituted for titanium for applications that require corrosion resistance. (Source: USGS, 2026)

Other Commodity Minerals for which the Region is a Top Producer

The following table lists additional mineral commodities for which one or more Persian Gulf or neighboring countries is among the top global producers. (Source: USGS, 2026)

Commodity Mineral	**Persian Gulf and Neighboring Countries 2025 Estimated Production** (units in metric tons, unless otherwise noted)	**Top 2 Producers in 2025 (as reference)** (units in metric tons, unless otherwise noted)
Antimony	Turkey (3,000), Pakistan (260), Iran (90)	China (40,000) and Russia (40,000)
Barite	Iran (300,000), Turkey (260,000), Pakistan (100,000)	India (3,000,000) and China (2,200,000)
Boron	Turkey (1,500,000)	Turkey (1,500,000) and Bolivia (380); US data withheld, but is a net exporter
Chromium	Turkey (9 million)	South Africa (23 million) and Turkey (9 million)
Clay - Bentonite	Turkey (2.5 million), Iran (1.3 million)	United States (4.1 million) and India (3.7 million)
Clay - Fuller's earth	Turkey (30,000)	United States (2,400,000) and India (730,000)
Clay – Kaolin	Iran (2.1 million), Turkey (2 million)	India (8.4 million) and China (7.8 million)
Cobalt	Turkey (1,900)	Congo (230,000) and Indonesia (44,000)
Diatomite	Turkey (150,000)	United States (720,000) and Denmark (380,000)
Feldspar	Turkey (5.3 million), Iran (3.9 million), Saudi Arabia (650,000),	India (6 million) and Turkey (5.3 million)

Fluorspar	Iran (70,000), Pakistan (50,000)	China (6 million) and Mexico and Mongolia (1.5 million each)
Garnet (industrial)	Pakistan (1,900)	Australia (350,000) and China (280,000)
Graphite	Turkey (2,200)	China (1.4 million) and Madagascar (80,000)
Gypsum	Iran (16 million), Oman (14 million), Turkey (10 million), Saudi Arabia (3.8 million)	United States (20 million) and Iran (16 million)
Helium	Qatar (63 million cubic meters)	United States (81 million cubic meters) and Qatar (63 million cubic meters); these two account for more than 75% of global production
Iodine	Iran (700)	Indonesia (23,000) and Japan (9,000)
Iron and Steel	Turkey (10 million), Iran (4 million)	China (830 million) and India (98 million)
Iron Ore (content)	Iran (61 million), Turkey (11 million)	Australia (600 million) and Brazil (260 million)
Iron Oxide Pigment	Pakistan (80,000)	India (3.4 million) and Germany (280,000)
Lead	Iran (70,000), Turkey (70,000)	China (1.9 million) and Australia (480,000)
Lime	Iran (4 million), Turkey (4 million)	China (310 million) and India (17 million)
Mica (natural)	Turkey (9,500)	China (85,000) and Finland (57,000)
Molybdenum	Iran (3,300)	China (97,000) and Chile (42,000)
Nitrogen – Fixed (Ammonia)	Saudi Arabia (5.2 million), Iran (4.8 million), Pakistan (3.8 million), Qatar (3 million), Oman (2 million),	China (49 million) and India and Russia (15 million each)
Perlite	Turkey (1.4 million), Iran (70,000)	China (1.5 million) and Turkey (1.4 million)
Phosphate Rock	Jordan (12 million), Saudi Arabia (10 million), Israel (2.4 million), Turkey (1.2 million)	China (110 million) and Morocco (36 million)
Pumice and Pumicite	Turkey (9.7 million), Jordan (1.1 million), Saudi Arabia (980,000)	Turkey (9.7 million) and Jordan (1.1 million)
Salt	Turkey (8.3 million), Iran (4.2 million), Pakistan (3.1 million), Saudi Arabia (2.4 million)	China (56 million) and United States (40 million)
Sand and Gravel (industrial)	Turkey (14 million), Saudi Arabia (2.1 million)	United States (120 million) and China (92 million)
Selenium	Turkey (43)	China (2,000) and Japan (640)
Soda Ash (natural)	Turkey (6 million)	United States (12 million) and Turkey (6 million). These two countries account for about 95% of global production
Strontium	Iran (250,000)	Iran (250,000) and Spain (100,000). These two countries account for more than 75% of global production. US has a 100% net import reliance on this.
Sulfur	Saudi Arabia (7.2 million), United Arab Emirates (6.3 million), Qatar (3.1 million), Iran (2.1 million), Kuwait (1.3 million)	China (19 million) and United States (8.1 million) – globally most sulfur production is a result of the processing of fossil fuels
Vermiculite	Turkey (10,000)	South Africa (160,000) and United States (100,000)
Zeolites	Turkey (58,000), Jordan (1,000)	Slovakia (280,000) and Georgia (240,000)

Supply Chain Impacts to Other Sectors

Agriculture

Natural gas is the key feedstock used to produce ammonia, the foundational input for most nitrogen fertilizers. Urea, which contains about 46% nitrogen, is the most widely used solid nitrogen fertilizer globally and plays a central role in crop production systems. The Middle East is an important hub for nitrogen fertilizer production and exports. Countries exposed to disruption in the region account for nearly 49% of global urea exports and about 30% of global ammonia exports, reflecting the concentration of fertilizer production and export capacity in and near the Persian Gulf. Major exporters include Iran, Qatar, Saudi Arabia and Egypt. Egypt also represents a vulnerability in nitrogen markets because fertilizer production there depends heavily on natural gas supplies, which can affect output when gas availability is disrupted. (Source: American Farm Bureau Federation, 2026)

Nitrogen is an essential plant nutrient that has no substitute. Ammonia is also used to produce explosives, plastics, synthetic fibers and resins, and numerous other chemical compounds. No practical substitutes for nitrogen explosives and blasting agents are known. (Source: USGS, 2026) An increase in use of ammonia in other sectors, can have an impact on agriculture either through direct impacts to supplies and/or market volatility.

Fertilizer markets are globally integrated, so supply disruptions in one region can influence prices and availability elsewhere. The United States relies on both domestic production and imports to meet fertilizer demand, and import exposure varies by nutrient. Roughly 97% of potassium is imported, 18% of nitrogen and 13% of phosphate. (Source: American Farm Bureau Federation, 2026)

Healthcare

Many petrochemical products serve as either direct inputs or precursor chemicals in the production of pharmaceuticals and medical products. Petroleum-derived compounds are used in the manufacture of a wide range of active pharmaceutical ingredients (APIs), solvents, reagents, and intermediates involved in drug production, as well as in the creation of packaging materials such as plastic vials, IV bags, blister packs, syringes, and protective medical packaging. As a result, disruptions affecting petrochemical supply chains can ripple through the pharmaceutical manufacturing ecosystem. Any tightening of petrochemical supplies or price volatility may intersect with freight bottlenecks, fuel market instability, and the geographic concentration of pharmaceutical manufacturing in certain regions, compounding potential risks to healthcare supply chains. While many pharmaceutical supply chains include some buffering through inventories and diversified sourcing, sustained disruptions across multiple sectors could create cascading pressures affecting production timelines, distribution networks, and the availability of certain medical products.

Water Sector

Availability of precursor materials for chemical production is necessary for a predictable supply of water treatment chemicals. Whether due to geographic concentration of precursor materials, reliance on foreign sources, competition for access, or logistics challenges that make transport of available resources impractical or impossible, supply of raw or precursor materials can be strained or interrupted. Additionally, chemical production capacity and distribution may not be able to adjust at a pace commensurate with rapid and unexpected changes in demand. Numerous chemicals used in water treatment are used across other industries that may experience fluctuations in demand, which can result in market volatility. (Source: EPA, 2023)

The following is a list of chemicals identified in by the EPA used in water treatment wither directly or as a precursor chemical that had a Persian Gulf or neighboring country among the top 5 worldwide exporters for that chemical in 2021:

- **Acrylamide**: Precursor chemical. This chemical is a petroleum byproduct. Domestic manufacturing is distributed but limited, imports are widely available. About 45% of domestic consumption is attributed to the water sector. Saudi Arabia #3 worldwide exporter in 2021. (Source: EPA, 2023)
- **Aluminum Sulfate:** A direct use chemical in water treatment. Strong domestic manufacturing provides some resilience, however, the U.S. is dependent on imports of bauxite for production of aluminum hydroxide. About 45% of domestic consumption is attributed to the water sector. Turkey #2 worldwide exporter in 2021.
- **Ammonium Hydroxide:** A direct use chemical in water treatment. Ammonium hydroxide is a principal source of nitrogen in liquid fertilizer and a primary source of nitrogen in household cleaners. Though it is widely manufactured, use in liquid fertilizer and household cleaners are prominent demands, which may leave tight

supply availability for other uses. There is widely distributed domestic manufacturing and supply. Less than 10% of domestic consumption is attributed to the water sector. Saudi Arabia #1 worldwide exporter in 2021. (Source: EPA, 2023)

- **Anhydrous Ammonia:** Direct use and precursor chemical. Anhydrous ammonia is the principal source of nitrogen in fertilizer and though it is widely manufactured, the majority is intended for use as fertilizer. The primary input is natural gas, which may fluctuate in availability and price. The production process is highly energy-intensive. Widely distributed domestic manufacturing and supply. Less than 2% of domestic consumption is attributed to the water sector. Saudi Arabia #3 worldwide exporter in 2021. (Source: EPA, 2023)
- **Bauxite**: Raw material. Alumina production is the leading domestic use of bauxite. Increases or decreases in demand for alumina derivatives; primarily aluminum, periodically impact the availability and price. Fluctuations in availability from leading worldwide producers also may impact availability. The U.S. is entirely reliant on imports of bauxite for alumina production. Less than 1% of domestic consumption is attributed to the water sector. (see mineral commodities section for more details) (Source: EPA, 2023)
- **Calcium Carbonate (Limestone):** Raw material, direct use chemical, and precursor chemical. It is abundant and production is widely distributed. Domestic commercial production took place at 1,960 quarries across 45 states. Less than 1% of domestic consumption is attributed to the water sector. Among the top 5 worldwide exporters the United Arab Emirates was #1 and Oman #3 in 2021. (Source: EPA, 2023)
- **Calcium Hydroxide (Slaked Lime):** Direct use and precursor chemical. Manufacturing and supply is widely distributed. Key raw material (calcium carbonate) is abundant and widely available. Less than 7% of domestic consumption is attributed to the water sector. Oman #5 worldwide exporter in 2021. (Source: EPA, 2023)
- **Fluorosilicic Acid:** Direct use chemical. Production of fluorosilicic acid depends on the production of phosphate rock and manufacturing of sulfuric acid. Limited domestic manufacturing concentrated in select geographic areas and strong reliance on imports. About 63% of domestic consumption is attributed to the water sector. Israel #2 worldwide exporter in 2021. (Source: EPA, 2023)
- **Silica:** Raw material. Use of silica in hydraulic fracturing is the leading domestic use. Increases or decreases in demand for hydraulic fracturing sand may periodically impact the availability and price of silica, however silica resources are abundant. The U.S. is a leading worldwide producer and net exporter of silica. Less than 3% of domestic consumption is attributed to the water sector. Saudi Arabia #4 worldwide exporter in 2021. (Source: EPA, 2023)
- **Sodium Carbonate:** Raw material, direct use chemical, and precursor chemical. The U.S. is home to the world's largest deposit of a natural source of sodium carbonate. Periodic price fluctuations and increases have historically been tied to fluctuations in demand for glass from the auto and construction industries and demand on the international market. Domestic production, though abundant, is concentrated in two geographic locations. About 1% of domestic consumption is attributed to the water sector. Turkey #2 worldwide exporter in 2021. (Source: EPA, 2023)
- **Sulfur**: Raw material. Price and availability of sulfur, the majority of which is recovered as a byproduct of petroleum processing, are closely tied to demand for petroleum products. A significant quantity of sulfur is produced in geographically concentrated areas and the majority of sulfur is intended for use in sulfuric acid manufacturing, both of which can increase vulnerability. The U.S. is a leading producer of sulfur, the majority of which is used to manufacture sulfuric acid. Less than 1% of domestic consumption is attributed to the water sector. Qatar #1 worldwide exporter in 2021. (Source: EPA, 2023)
- **Zinc**: Raw material. The U.S. produces significant quantities of zinc ores. Supply of refined zinc is heavily reliant on imports from foreign smelters. Refined zinc is used to manufacture zinc-based corrosion inhibitors, such as zinc orthophosphate. Less than 1% of domestic consumption is attributed to the water sector. Turkey #3 worldwide exporter in 2021. (Source: EPA, 2023)

Other Supply Chain Considerations

Maritime Shipping

Suspension of Operations

Due to operational and security constraints in the Upper Gulf region maritime shippers are suspending operations at all or some of the ports in the regions, affecting cargo to and from those ports.

- Hapag-Lloyd suspended operations for United Arab Emirates, Iraq, Kuwait, Qatar, Bahrain, Oman (Sohar), Saudi Arabia (Dammam and Jubail), and Yemen. (Source: Hapag-Lloyd, 3/4/26)
- Maersk has suspended Suspension of all bookings to and from the UAE, Oman, Iraq, Kuwait, Jordan, Qatar, Bahrain, Saudi Arabia for Reefer, DG, and OOG/In-gauge shipments. The suspensions applies to cargo originating from, destined for, or transhipping through these countries (exception Salalah transhipment to non-upper gulf Countries or between non-upper gulf countries, or between non-upper Gulf countries, for example shipping from Seychelles to Turkey, transshipping in Salalah). For dry cargo shipments, Maersk is suspending all booking to/from UAE, Iraq, Kuwait, Qatar, Saudi Arabia (Dammam & Al Jubail), Oman (Sohar) & Bahrain. Dry cargo bookings to/from Saudi Arabia (Jeddah & King Abdullah port), Jordan & Oman (Salalah), Lebanon and Israel are being accepted. Shipments that contain critical foodstuff, medicine and perishable goods are being given special attention where possible. (Source: Maersk, 3/9/26)

Global Surcharges

Due to the fuel price volatility shippers are implementing emergency fuel surcharges for all routes worldwide. For example, Hapag-Lloyd is implementing a surcharge starting between March 23 – April 8 depending on region and the additional cost ranges between US$70 - $225 per TEU depending on container type and direction. Maersk announced it will be implementing a 20% temporary surcharge globally starting March 25, to be re-evaluated every 14 days. (Sources: Hapag-Lloyd, 3/9/26; Maersk, 3/10/26)

Regional Surcharges

In addition to the global emergency fuel surcharges, emergency freight and war risk surcharges are also being added for cargo loading from or destined to ports in the region. For example,

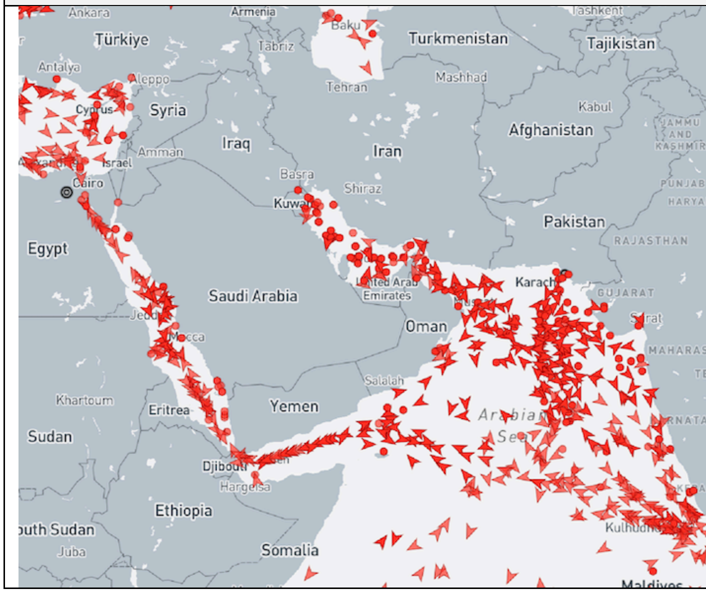
- Maersk is implementing an Emergency Freight Rate to cover finding alternative routing and storage in transit for cargo loading from or destined to ports in Iraq, Kuwait, Saudi Arabia (Damman & Jubail), Bahrain, Qatar, the United Arab Emirates, and Oman (except Salalah). Cost per container ranges from US$1,800 for 20' dry cargo container to US$3,800 for Reefer, Special and DG containers. (Source: Maersk, 3/9/26)
- Hapag-Lloyd has implemented a War Risk Surcharge for cargo to and from or via the Upper Gulf, Arabian Gulf, and Persian Gulf. Surcharge ranges from USD 1,500 per TEU for standard containers USD 3,500 per container for reefer containers and special equipment. This surcharge applies to any booking issued on or after March 2, 2026, all bookings already issued but which have not yet shipped, as well as to cargo already on the water but not yet discharged or loaded to/from Iraq, Bahrain, Kuwait, Qatar, Oman, United Arab Emirates, Yemen and Saudi Arabia (Dammam and Jubail). For shipments within FMC scope, a War Risk Surcharge (WRS) will be introduced for cargo moving between the USA and the following countries (in either direction), whether originating in or routed via them: United Arab Emirates, Saudi Arabia, Kuwait, Qatar, Bahrain, Iraq, Oman, Yemen and Pakistan. Within this scope, the WRS will apply at the amounts referenced above, effective April 1, 2026, until further notice. (Source: Hapag-Lloyd, 3/1/26)

Empty Containers

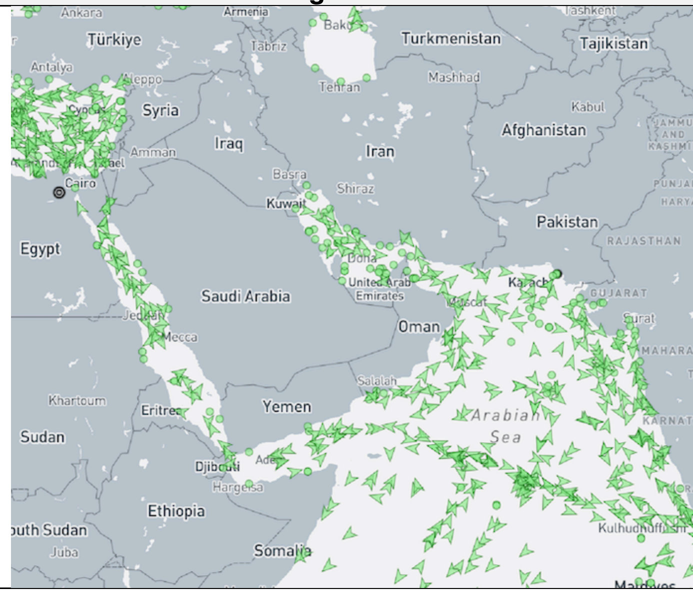
The suspension of operations at certain ports is also affecting the ability of companies to return empty shipping containers. For example, Maersk is only accepting empty container returns at three designated depots: Oman – Salalah & Sohar and Saudi Arabia – Jeddah. (Source: Maersk, 3/9/26)

Maritime Shipping Map

Tanker Vessels



Cargo Vessels



Source: Marine Traffic, March 10, 2026 at 8:26pm

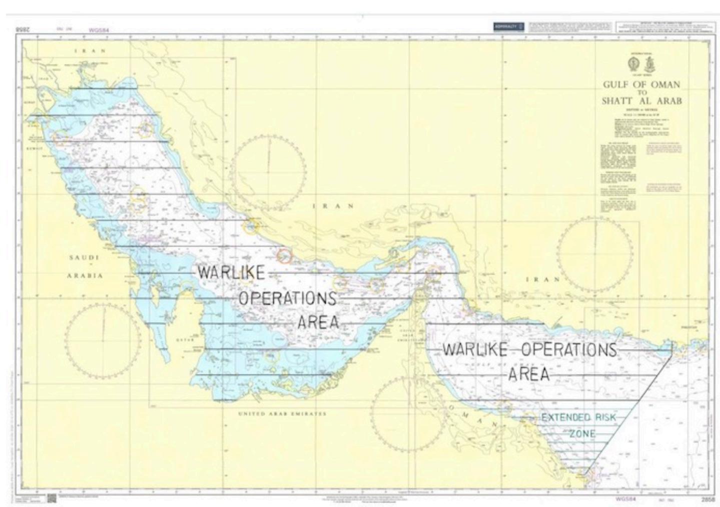
Air Cargo

February 28, revised March 6, the European Union Aviation Safety Agency (EASA) issued a Conflict Zone Information Bulletin – "Given the ongoing military intervention, retaliatory actions against U.S. and Israeli assets in the region are likely to occur, introducing additional high risks not only to the airspace of Iran but also to that of neighbouring States hosting U.S. military bases or otherwise affected by the hostilities and associated military activities, including interceptions. The possession of all-altitude capable air-defence systems, cruise and ballistic missiles and the use of air assets capable to operate at all-altitudes, including interception capability make the entire affected airspace vulnerable to spill-over risks, misidentification, miscalculation and failure of interception procedures. Given the current and expected developments, there is thus a high risk to civil aviation in the affected airspace." (Source: EASA, 2026)

As of March 10, the FAA has not issued any current Prohibitions, Restrictions and Notices regarding the airspace in the Middle East. (Source: FAA)

Labor Contracts and War Risk Considerations

The International Transport Worker's Federation has designated the Persian Gulf, Straits of Hormuz and Gulf of Oman as a IBF Warlike Operations Area. This means when a vessel enters these waters sailors receive bonus equal to basic wage, payable for 5 days minimum + per day if longer; doubled compensation for death and disability; right to refuse sailing into the area, with repatriation at company's cost and compensation equal to 2 month's basic wage; and ship operators are recommended too implement enhanced security arrangements equivalent to ISPS Level 3. (Source: ITF, 2026)



Shipping Insurance and War Risk Considerations

Insurance markets play a critical but often overlooked role in the movement of global goods. Commercial vessels typically carry multiple layers of insurance coverage, including hull insurance, cargo insurance, and specialized war risk insurance that covers losses associated with armed conflict, terrorism, or military activity. When geopolitical tensions escalate in or near key maritime corridors—such as the Persian Gulf and the Strait of Hormuz—insurers may reassess the risk environment and adjust coverage requirements. This can result in higher premiums, additional surcharges, or restrictions on coverage for vessels transiting affected areas. In some cases, ship operators may be unwilling or unable to transit high-risk areas if adequate insurance coverage is not available or becomes prohibitively expensive. These dynamics can influence shipping behavior by increasing transportation costs, delaying shipments, or prompting carriers to reroute vessels to avoid higher-risk waters. As a result, changes in the availability or cost of war risk insurance can indirectly affect supply chain reliability, transit times, and the overall flow of commodities moving through strategically important maritime chokepoints.
March 3, the International Underwriting Association's Joint Committee updated its JWC Listed Areas for Hull War, Piracy, Terrorism and Related Perils to include Bahrain, Djibouti, Kuwait, Oman, Qatar and amended the area for Persian/Arabian Gulf, Gulf of Oman, Indian Ocean, Gulf of Aden and Southern Red Sea. The full list of Middle East countries now includes: Bahrain, Iran, Iraq, including all Iraqi offshore oil terminals, Israel, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia (Gulf coast), Saudi Arabia (Red Sea coast) excluding transits, Syria, United Arab Emirates, and Yemen. (Source: International Underwriting Association, 2026)

U.S. Gulf Coast Petrochemical Production and Compounding Risk

The United States maintains a significant buffer in global petrochemical markets due to the large concentration of petroleum refining and petrochemical production capacity along the U.S. Gulf Coast. This infrastructure allows the U.S. to process substantial volumes of crude oil domestically and produce a wide range of refined fuels and petrochemical feedstocks used in manufacturing, agriculture, and industrial supply chains. In the context of disruptions affecting oil and gas production or exports from the Persian Gulf region, this domestic capacity can partially offset global supply constraints and support continued availability of certain petroleum-based products. However, this buffer also creates a potential compounding risk scenario. If global energy markets remain strained due to disruptions in the Persian Gulf and a major hurricane were to directly impact the U.S. Gulf Coast, the resulting loss of refining or petrochemical capacity could have outsized effects. With global spare capacity already reduced, the ability of international markets to absorb an additional shock could be limited, potentially amplifying impacts on fuel supplies, petrochemical feedstocks, and downstream industries.

Crude Oil Fundamentals

Types of Crude Oil

The physical characteristics of crude oil determine how refineries process it. In simple terms, crude oils are classified by density (API gravity) and sulfur content. Less dense (lighter) crude oils (with higher API gravity) generally have more light hydrocarbons. Refineries can produce high-value products such as gasoline, diesel fuel, and jet fuel from light crude oil with simple distillation. When refineries use simple distillation on denser (heavier) crude oils (with lower API gravity), they produce low-value products. Heavy crude oils require additional, more expensive processing to produce high-value products. Some crude oils also have a high sulfur content, which is an undesirable characteristic in both processing and product quality. (Source: EIA, 2024)

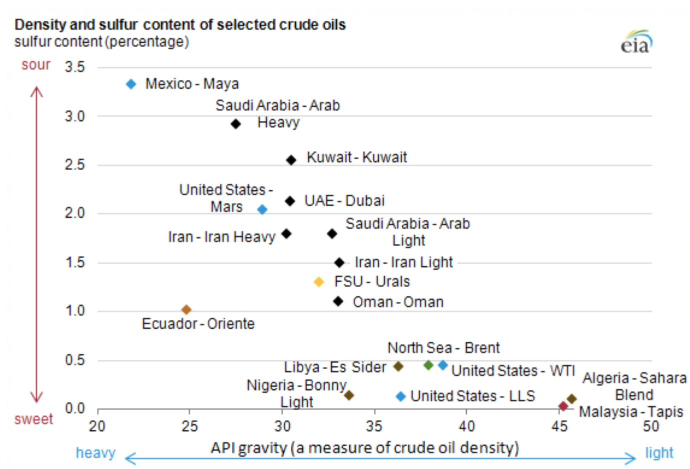


Image Source: US Energy Information Administration - Crude Oils Have Different Quality Characteristics)

Production

Production of crude oil and natural gas is sometimes called conventional production or unconventional production. Conventional production generally means that crude oil and natural gas flow to and up a well under the natural pressure of the earth. Unconventional production requires techniques and technologies to increase or enable oil and natural gas production beyond what might occur using conventional production techniques. (Source: EIA, 2023)

After crude oil is removed from the ground, it is sent to a refinery where different parts of the crude oil are separated into useable petroleum products. (Source: EIA, 2023)

Impacts of Temporary Pauses of Oil Wells

Temporary shutdowns ("shut-ins") of oil wells can create operational challenges that complicate efforts to quickly restore production. When an oil well is shut-in, everything left in the well and the surface facilities is subject to corrosion, deterioration, and other chemical/mechanical effects. Perforations and the well itself may become plugged and deformed and the pumps and bottomhole assemblies may be rendered dysfunctional due to the settlement of sand and other debris/contaminants. Moreover, scale buildup and wax and asphaltene precipitation in and around the wellbore are well-known potential problems during shut-ins. These processes can restrict flow paths and reduce the efficiency of the well once operations resume. When large numbers of wells are shut in simultaneously or remain offline for extended periods, the process of restoring production can become more complex. In some cases, wells may require workovers, recompletions, restimulation, or chemical treatments to restore flow. For wells that were already marginal producers, these interventions may not always be economically or technically viable. If a large number of wells require remediation at the same time, the availability of specialized equipment, materials, and technical expertise could also become a constraint, potentially extending the timeline for bringing production back online. (Source: Journal of Petroleum Technology, 2020)

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