



Country Analysis Brief: World Oil Transit Chokepoints

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Overview

Table 1. Volume of crude oil and petroleum liquids transported through world chokepoints and the Cape of Good Hope, 2018–2023

million barrels per day

Location	2018	2019	2020	2021	2022	2023
Strait of Malacca	23.0	23.1	22.8	21.9	22.9	23.7
Strait of Hormuz	21.4	20.0	18.4	19.0	21.1	20.9
Suez Canal and SUMED Pipeline	6.4	6.2	5.3	5.1	7.3	8.8
Bab el-Mandeb	6.4	6.0	5.2	5.4	7.5	8.6
Danish Straits ^a	3.3	3.4	3.1	3.1	4.2	4.9
Turkish Straits (Dardanelles)	3.4	3.5	3.3	3.4	3.2	3.4
Panama Canal ^b	1.4	1.5	1.7	1.8	2.1	2.1
Cape of Good Hope	7.6	7.5	7.7	7.0	5.9	6.0
World maritime oil trade	78.5	78.2	73.0	74.3	76.2	77.5
World total oil supply	100.1	100.9	91.6	97.6	99.9	101.9

Data source: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, May 2024, and EIA analysis based on Vortexa tanker tracking and Panama Canal Authority, using EIA conversion factors and calculations.

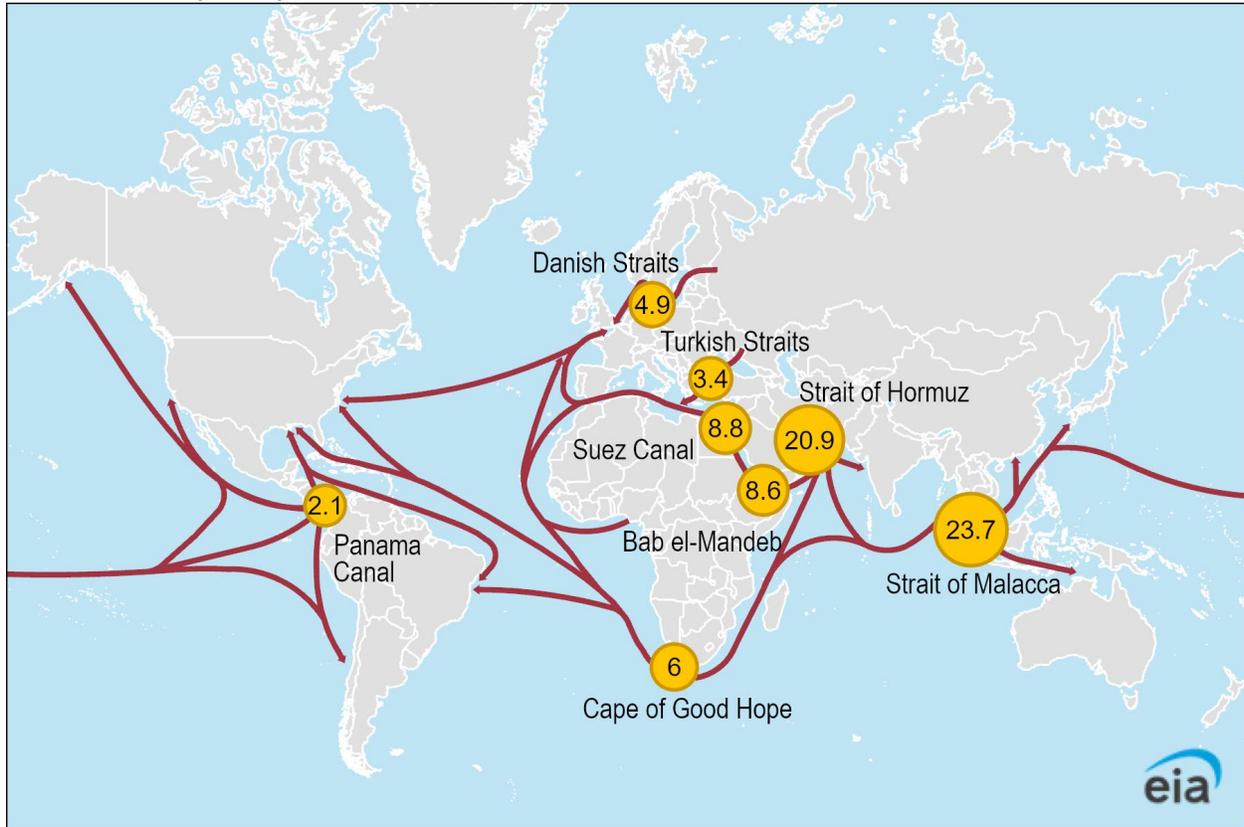
^a The Danish Straits do not include flows through the Kiel Canal.

^b Data for the Panama Canal are by fiscal year (October 1 to September 30).

- Chokepoints are narrow channels along widely used global sea routes that are critical to global energy security. Some chokepoints are so narrow that restrictions are placed on the size of the vessel that can navigate through them. Chokepoints are a critical part of global energy security because of the high volume of petroleum and other liquids and liquified natural gas transported through their narrow straits.
- International energy markets depend on reliable transport routes. The inability of oil to transit a major chokepoint, even temporarily, can lead to substantial supply delays and higher shipping costs, resulting in higher world energy prices. Although most chokepoints can be circumvented by using other routes that add significantly to transit time, some chokepoints have no practical alternatives.
- The seven chokepoints highlighted in this report are part of major trade routes for global seaborne oil transportation. Disruptions to these routes could affect oil prices and add thousands of miles of transit in alternative routes. By volume of oil transit, the Strait of Hormuz, leading out of the Persian Gulf, and the Strait of Malacca (linking the Indian and Pacific Oceans) are the world's most important strategic chokepoints (Figure 1). This report also discusses the role of the Cape of Good Hope, which is not a chokepoint but is a major trade route and potential alternative route to certain chokepoints.
- In 2023, total world petroleum and other liquids supply was about 101.9 million barrels per day (b/d).¹ We estimate that about 76% of that amount (77.5 million b/d) traveled via seaborne trade (Table 1).² Oil tankers accounted for almost 29% of the world's shipping by deadweight

tonnage in 2022, according to data from the United Nations Conference on Trade and Development (UNCTAD).³

Figure 1. Daily transit volumes of petroleum and other liquids through world maritime oil chokepoints (million barrels per day) (2023)



Data source: U.S. Energy Information Administration (EIA) analysis, based on Vortexa tanker tracking and Panama Canal Authority, using EIA conversion factors and calculations

Strait of Malacca

- The Strait of Malacca, linking the Indian Ocean and the Pacific Ocean, is the shortest sea route between Middle East oil and natural gas suppliers and growing markets in East and Southeast Asia (Figure 2). Other alternative straits around the Strait of Malacca are two smaller Pacific Ocean chokepoints in the Indonesian archipelago, the Sunda Strait and the Lombok Strait (Figure 2).
- This strait is the primary chokepoint in Asia, with an estimated 23.7 million b/d of oil flow in 2023, and it is the largest chokepoint in the world in terms of oil transit volume. Crude oil generally makes up an estimated 70% of total oil flows per year, and petroleum products account for the remainder (Table 2).
- According to the International Maritime Bureau's Piracy Reporting Centre, piracy, including attempted theft and hijackings, is a threat to tankers in the Strait of Malacca, and attacks on ships increased after 2018, especially around Singapore.⁴
- Total oil flows through Malacca fell by 1.2 million b/d between 2019 and 2021 as a result of the decline in oil demand resulting from the global COVID-19 pandemic.⁵ China, the top importer for crude oil that passes through the Strait of Malacca, imposed one of the world's longest lockdowns, which delayed its crude oil import recovery until around 2023. Other top importers through the strait include South Korea and Japan.
- Between 2021 and 2023, total oil flows through Malacca rose by 1.8 million b/d. Key Persian Gulf OPEC producers (Saudi Arabia, United Arab Emirates, Kuwait, and Iraq), which transported nearly 60% of crude oil going through the Strait of Malacca in 2023, made up a large share of this growth. However, in 2023, the additional OPEC+ crude oil production cuts⁶ limited what these countries could export to Asia, and [Kuwait shifted some crude oil exports to new refining capacity](#).
- The United States, Iran, and Russia also drove some of the crude oil export increases through Malacca from 2021 through 2023 (Figure 3). U.S. Gulf Coast crude oil production and exports rose significantly over the past five years with a sizeable amount going to East and Southeast Asia.⁷ Despite Western sanctions on its oil exports, Iran has been able to increase oil production and exports to China.
- Shifts in global trade patterns because of sanctions on Russia starting in 2022 caused more of Russia's oil from the Baltic Sea and Black Sea to travel through the Suez Canal and the Strait of Malacca to Asia. Russia's crude oil exports to India, some which originated in Russia's Far Eastern ports and traveled westbound through the Strait of Malacca, rose significantly beginning in 2022.⁸
- Crude oil exports from Africa traversing Malacca fell from a high of 1.8 million b/d in 2018 to less than 1.0 million b/d in 2023 because of falling production.⁹
- The Malay Archipelago, including Indonesia and Malaysia, has significant intra-country shipping that traveled through the Strait of Malacca. Over the past five years, between 600,000 b/d and 700,000 b/d of total petroleum liquids made up intra-country cargoes.¹⁰
- The Strait of Malacca is also an important transit route for liquefied natural gas (LNG) from the Persian Gulf and African suppliers, particularly Qatar, to East Asian countries with growing LNG demand. The top importers of LNG in the region are Japan, China, and South Korea.¹¹
- During the past decade, China invested in alternative import options for crude oil and natural gas via pipelines that would replace some of the hydrocarbons that transit the Strait of Malacca. Parallel crude oil and natural gas pipelines run from the western coast of Burma

- (Myanmar) to the Yunnan province in southwest China. China and Burma commissioned the Myanmar-China natural gas pipeline in 2013 to export onshore natural gas from Burma to China. This pipeline runs significantly under its capacity of 424 billion cubic feet per year (Bcf/y) because Burma's natural gas production is lower than previously expected.¹² The crude oil pipeline, which began operating in mid-2017, has a capacity of 440,000 b/d and serves China's Yunnan refinery. The Myanmar-China oil pipeline transports Middle Eastern crude oil and allows it to bypass the Strait of Malacca and travel a shorter distance to southwest China. Oil flows through the pipeline reached 219,000 b/d in 2023.¹³
- Northeastern China imports crude oil from eastern Siberian fields in Russia through the Eastern Siberia-Pacific Ocean pipeline and doubled the capacity of this route by constructing a parallel pipeline. In 2018, capacity increased from 300,000 b/d to 600,000 b/d, allowing China to import more crude oil via pipeline, which replaced some sea-faring volumes traversing the Strait of Malacca.¹⁴
 - In 2019, China also began to import natural gas through the Power of Siberia pipeline from eastern Russia, which provides another source of natural gas for China apart from its large LNG flows that pass through the Strait of Malacca. China imported about 565 billion cubic feet (Bcf) of pipeline natural gas from Russia in 2022. The Power of Siberia's capacity is 1.3 trillion cubic feet per year, which allows China to increase imports through this route.¹⁵

Figure 2. Map of Strait of Malacca and Pacific Ocean chokepoints



Data source: U.S. Energy Information Administration

Table 2. Volume of crude oil, condensate, and petroleum products transported through the Strait of Malacca (2018–2023)

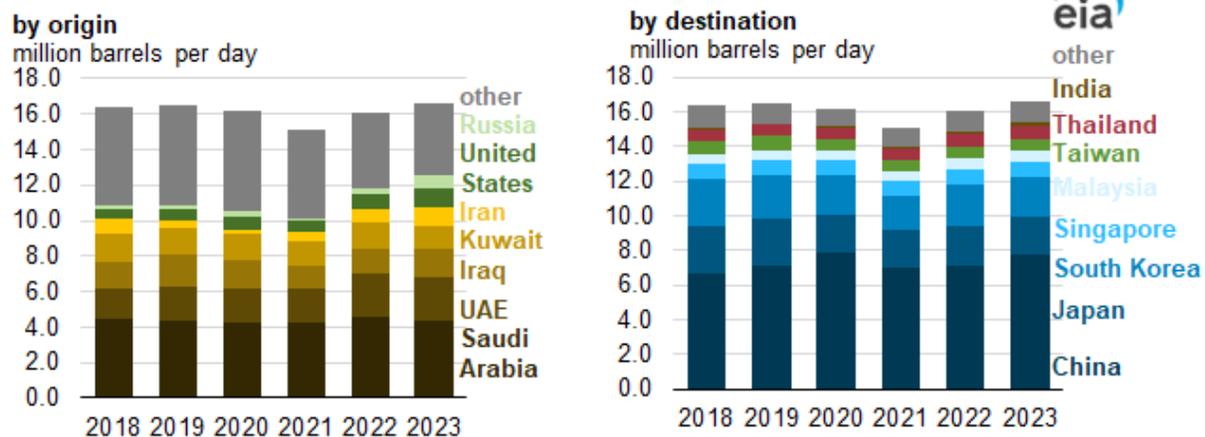
million barrels per day

	2018	2019	2020	2021	2022	2023
Total oil flows through the Strait of Malacca	23.0	23.1	22.8	21.9	22.9	23.7
Crude oil and condensate	16.4	16.5	16.2	15.1	16.1	16.6
Petroleum products	6.7	6.6	6.6	6.8	6.8	7.0
LNG flows through Strait of Malacca (billion cubic feet per day)	7.8	6.9	7.2	8.6	8.0	9.0

Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Note: LNG=liquefied natural gas

Figure 3. Volume of crude oil and condensate transported through the Strait of Malacca



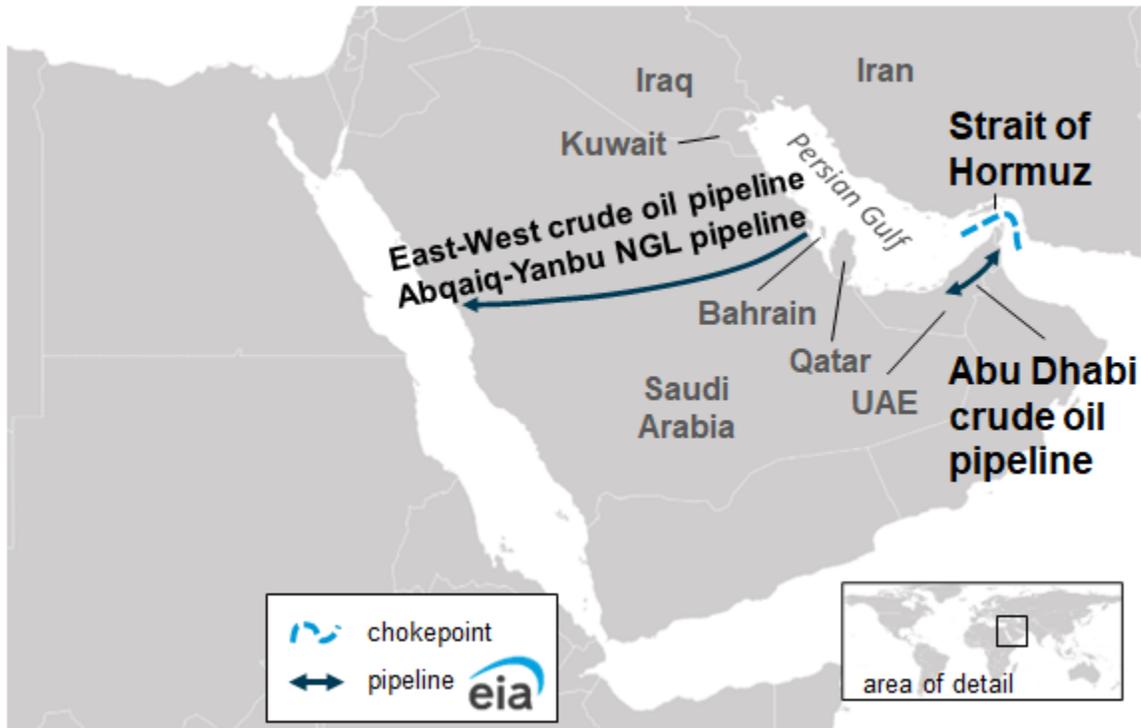
Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Strait of Hormuz

- The Strait of Hormuz, located between Oman and Iran, connects the Persian Gulf with the Gulf of Oman and the Arabian Sea (Figure 4). The Strait of Hormuz is deep enough and wide enough to handle the world's largest crude oil tankers, and it is one of the world's most important oil chokepoints. Large volumes of oil flow through the strait, and very few alternative options exist to move oil out of the strait if it is closed.
- Flows through the Strait of Hormuz in 2023 made up more than one-quarter of total global seaborne traded oil. In addition, around one-fifth of global liquefied natural gas (LNG) trade also transited the Strait of Hormuz in 2023.¹⁶
- In 2023, oil flows through Hormuz averaged 20.9 million barrels per day (b/d), or the equivalent of about 20% of global petroleum liquids consumption. Total oil flows through the Strait of Hormuz in 2023 were slightly lower compared with 2022 because decreased flows of crude oil and condensate offset increased flows of oil products (Table 3 and Figure 5).¹⁷

- Between 2020 and 2022, volumes of crude oil, condensate, and petroleum products transiting the Strait of Hormuz rose by 2.7 million b/d as oil demand increased, following the economic downturn related to the COVID-19 pandemic. OPEC+ members made crude oil production cuts that continued into 2023, the main reason behind lower crude oil exports and flows out of the Strait of Hormuz, particularly by Saudi Arabia, Kuwait, and the United Arab Emirates (UAE). These cuts offset the higher crude oil exports from Iran, which is not subject to OPEC+ production cuts, most of which were destined for China (Figure 6). Although Iran's oil exports fell after the United States re-imposed sanctions in 2018, [Iran increased oil exports mainly to China](#) after 2020.¹⁸
- Saudi Arabia moves more crude oil and condensate through the Strait of Hormuz than any other country, most of which is exported to other countries. Around 0.3 million b/d transited the strait in 2023 from Saudi ports in the Persian Gulf, most notably Ras Tanura, to Saudi ports in the Red Sea, including Jizan, which is co-located with the 0.4 million b/d Jizan refinery.¹⁹
- We estimate that 83% of the crude oil and condensate that moved through the Strait of Hormuz went to Asian markets in 2023. China, India, Japan, and South Korea were the top destinations for crude oil moving through the Strait of Hormuz to Asia, accounting for 69% of all Hormuz crude oil and condensate flows in 2023 (Figure 6).²⁰
- In 2023, the United States imported about 0.5 million b/d of crude oil and condensate from Persian Gulf countries through the Strait of Hormuz,²¹ accounting for about 8% of U.S. crude oil and condensate imports and 2% of U.S. petroleum liquids consumption.²² U.S. crude oil imports from countries in the Persian Gulf have fallen by half since 2018 as domestic production has increased.
- Qatar exported about 9.5 trillion cubic feet per day (Tcf/d) of LNG through the Strait of Hormuz in 2023, and the UAE exported about 0.6 Tcf/d. Kuwait imports small amounts of LNG that travel northward through the Strait of Hormuz.²³
- Only Saudi Arabia and the UAE have operating crude oil pipelines that can circumvent the Strait of Hormuz. Saudi Aramco operates the 5 million-b/d East-West crude oil pipeline and temporarily expanded the pipeline's capacity to 7 million b/d in 2019 when it converted some natural gas liquids pipelines to transport crude oil.²⁴ The UAE links its onshore oil fields to the Fujairah export terminal on the Gulf of Oman with a 1.5 million-b/d pipeline.²⁵ We estimate that around 2.6 million b/d of effective unused oil capacity from these pipelines could be available to bypass the strait in the event of a supply disruption.²⁶
- Iran inaugurated the Goreh-Jask oil pipeline and the Jask oil export terminal on the Gulf of Oman with a single export cargo in July 2021. The pipeline's capacity was 0.3 million b/d at that time, although Iran has not used the pipeline since then.²⁷
- Attacks on vessels by the Yemen-based Houthi group in the Red Sea that began in November 2023 and overall conflict in the Middle East have not affected energy flows through the Strait of Hormuz, as of April 2024.

Figure 4. Map of Strait of Hormuz and Arabian Peninsula



Data source: U.S. Energy Information Administration
 Note: NGL= Natural gas liquids

Table 3. Volume of crude oil, condensate, and petroleum products transported through the Strait of Hormuz (2018–2023)

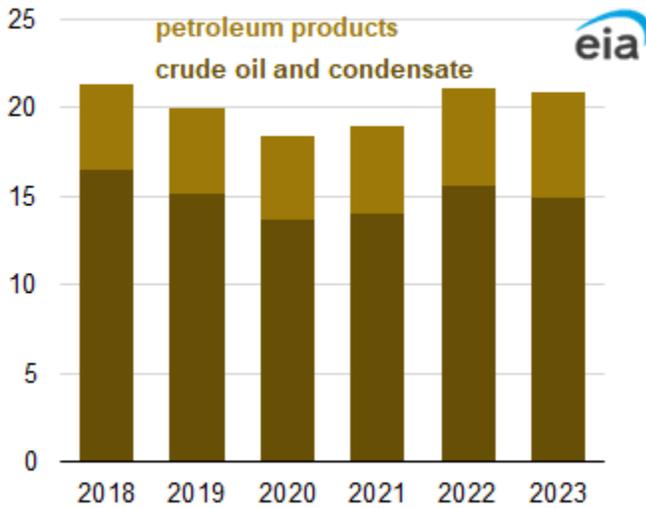
million barrels per day

	2018	2019	2020	2021	2022	2023
Total oil flows through the Strait of Hormuz	21.4	20.0	18.4	19.0	21.1	20.9
Crude oil and condensate	16.5	15.2	13.7	14.0	15.6	14.9
Petroleum products	4.9	4.9	4.8	4.9	5.5	5.9
World maritime oil trade	78.5	78.2	73.0	74.3	76.2	77.6
World total petroleum and other liquids consumption	100.1	100.9	91.6	97.6	99.9	101.9
LNG flows through Strait of Hormuz (billion cubic feet per day)	10.3	10.6	10.4	10.5	10.9	10.4

Data source: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, May 2024, and EIA analysis based on Vortexa tanker tracking and FACTS Global Energy.

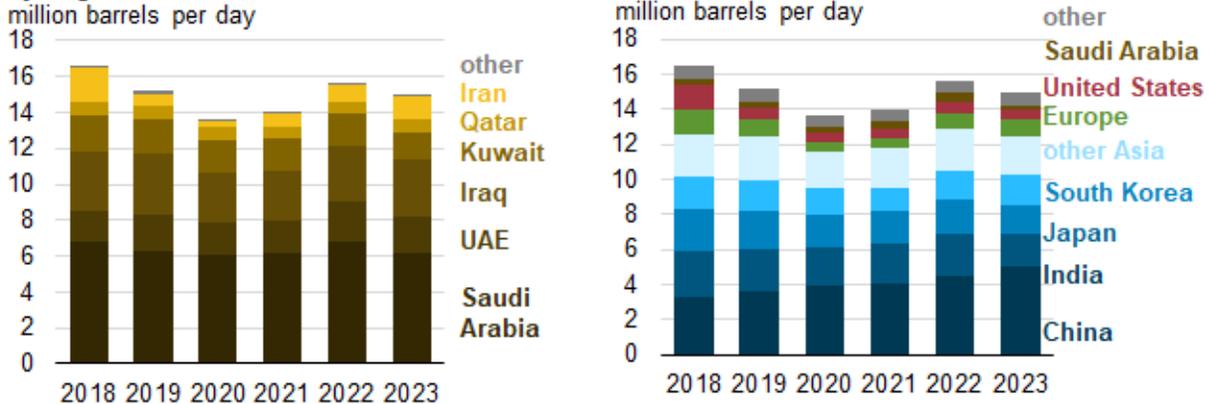
Note: World maritime oil trade excludes intra-country volumes except those volumes that transit global chokepoints and the Cape of Good Hope. LNG=liquefied natural gas

Figure 5. Volume of total oil petroleum liquids transported through the Strait of Hormuz
million barrels per day



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking and FACTS Global Energy

Figure 6. Volume of crude oil and condensate transported through the Strait of Hormuz
million barrels per day



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Suez Canal, SUMED pipeline, and Bab el-Mandeb Strait

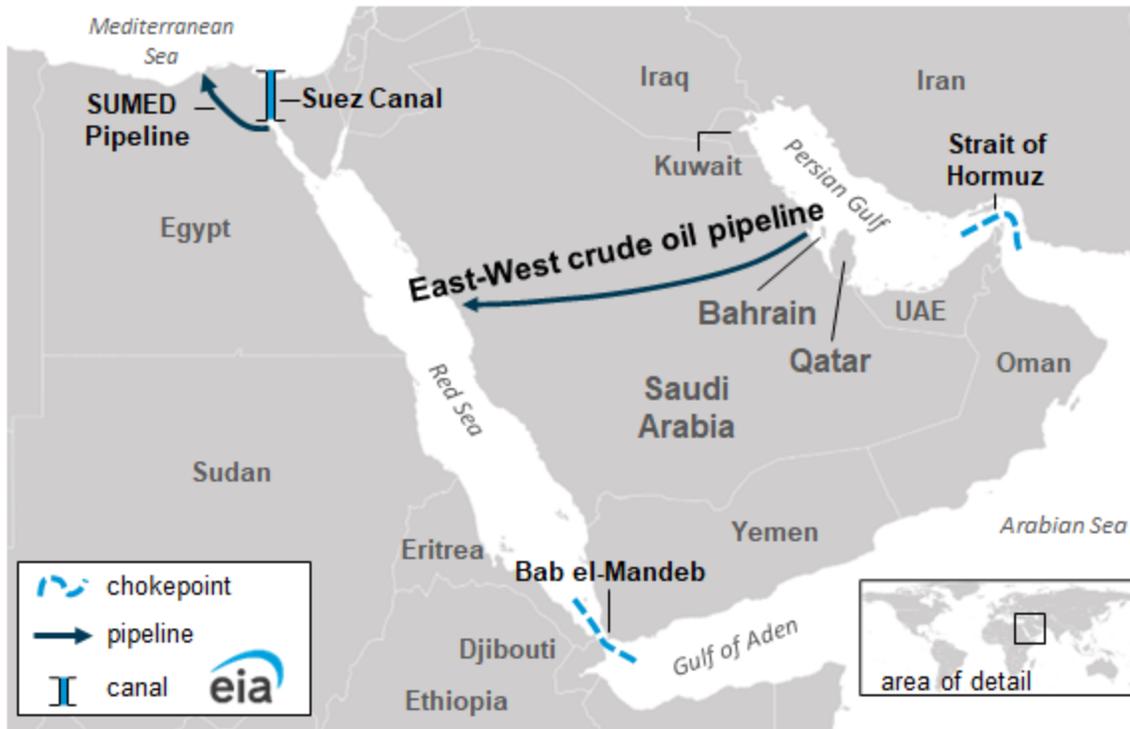
- The Suez Canal, the SUMED pipeline, and the Bab el-Mandeb Strait are strategic routes for Persian Gulf oil and natural gas shipments to Europe and North America (Figure 7). Total oil shipments via these routes accounted for about 11% of total seaborne-traded oil in 2023, and liquefied natural gas (LNG) shipments accounted for about 8% of worldwide LNG trade.²⁸
- The Suez Canal and SUMED pipeline are in Egypt and connect the Red Sea with the Mediterranean Sea. The SUMED pipeline, owned by Mubadala Energy, transports crude oil north through Egypt between the ports of Ain Sukhna and Sidi Kerir and has a capacity of 2.5

million barrels per day.²⁹ The Bab el-Mandeb Strait is between the Horn of Africa and the Middle East, connecting the Red Sea to the Gulf of Aden and Arabian Sea. Most exports of petroleum and natural gas from the Persian Gulf to Europe and North America pass through multiple chokepoints, including the Suez Canal or the SUMED pipeline and both the Bab el-Mandeb and the Strait of Hormuz.

- Northbound oil flows toward Europe via the Suez Canal and SUMED pipeline fell between 2018 and 2020 (Table 4). Renewed U.S. sanctions on Iran reduced all exports from Iran, including those through the Suez Canal. In addition, less crude oil and oil products from Middle East producers moved through the Suez Canal because Europe imported less oil from the Middle East and more from the United States during those years.³⁰ The COVID-19 pandemic further reduced flows through the Suez Canal because of slowing global oil demand.
- In 2023, total oil flowing northbound through the Suez Canal and SUMED pipeline had increased by nearly 50% from 2020, as demand in Europe and the United States rose from pandemic-induced lows. Western countries imposed sanctions on Russia's oil beginning in early 2022, which also shifted global trade patterns, leading Europe to import more oil from the Middle East via the Suez Canal and SUMED pipeline and less from Russia (Figure 8).³¹
- Southbound shipments through the Suez Canal rose significantly between 2021 and 2023, largely because of Western sanctions on Russia's oil exports. Oil exports from Russia accounted for nearly 70% of Suez southbound oil traffic in 2023, up from 23% in 2021 (Figure 9). Most of those export volumes were destined for India and China, which imported mostly crude oil from Russia.³² The Middle East, primarily Saudi Arabia and the UAE, increased imports of refined oil products from Russia in 2022 and 2023, which were used to generate electric power or were stored or re-exported.³³
- LNG flows through the Suez Canal in both directions rose to a combined peak of 4.5 billion cubic feet per day (Bcf/d) in 2021 and in 2022 before total flows declined in 2023 to 4.0 Bcf/d. Southbound LNG flows more than doubled from 2020 to 2021, mainly driven by growing exports from the United States and Egypt heading to Asia.³⁴ In 2018, Russia began sending cargoes to Asia via the Baltic Sea or Black Sea and south through the Suez Canal and Bab el-Mandeb during winter months.³⁵ These LNG volumes came from the Yamal LNG plant in the Arctic Sea.
- In 2022, southbound LNG volumes via the Suez Canal declined as U.S. and Egyptian LNG exports both favored European destinations over Asian markets, offsetting some of the natural gas exports that Russia historically sent to Europe. However, in 2023, drought-caused delays at the Panama Canal required U.S. southbound exports to re-route through the Suez Canal. Qatar sent more LNG to Europe in 2022 (via the Suez Canal), which partially offset decreased Europe-bound exports from Russia, increasing northbound flows.³⁶
- Although oil flow trends through the Bab el-Mandeb Strait are similar to those of the Suez Canal, more oil exits the Red Sea (northbound via the Suez Canal and southbound via the Bab el-Mandeb Strait) than enters the Red Sea through these chokepoints. Saudi Arabia transports some crude oil from the Persian Gulf via the East-West pipeline to the Red Sea for export mostly to Europe. LNG flows through the Bab el-Mandeb Strait have matched those in the Suez Canal over the last few years because LNG volumes imported into the Red Sea have been low (Figure 10).
- Besides the SUMED pipeline, the only other crude oil pipeline that circumvents the Suez Canal from the Mediterranean Sea is the Eilat Ashkelon Pipeline Company (EAPC) pipeline, which connects the Israeli ports of Ashkelon on the Mediterranean Sea and the Eilat port on

- the Red Sea. This pipeline has not operated since March 2023 after Türkiye closed the Iraq-to-Türkiye pipeline, which had been previously used to export northern Iraq's crude oil production through Ceyhan. Israel imported crude oil from northern Iraq and re-exported some of it through the EAPC pipeline.³⁷ The closure of the Iraq-to-Türkiye pipeline also shut in at least [400,000 b/d of northern Iraq's exports](#) that bypassed the Red Sea. As a result, Iraq almost completely relies on its southern terminals to export its crude oil to Atlantic Basin ports either through the Red Sea or around the Cape of Good Hope.
- Disruptions to the Bab el-Mandeb or Suez Canal force ships to take a much longer route around the Cape of Good Hope along Africa's southern end. This longer route from the Persian Gulf to northwestern Europe [nearly doubles the travel time](#) and increases freight rates and shipping costs.³⁸
 - In mid-November 2023, Houthi rebel groups from Yemen began to attack ships around the Bab el-Mandeb Strait and in the Red Sea.³⁹ Initially, these attacks affected mostly container ships transporting non-energy goods. However, as the attacks have escalated, more oil and LNG vessels are avoiding the Bab el-Mandeb and Suez Canal route and are traveling the longer route around Africa.⁴⁰ The longer trade route increases shipping costs to oil tankers and delays voyages. Ships that opt to traverse the Bab el-Mandeb and the Suez Canal face higher insurance risk premiums.
 - U.S. Gulf Coast cargoes of hydrocarbon gas liquids to Asia began to traverse the Suez Canal when [disruptions to shipping in the Panama Canal](#) began in the second half of 2023. After the Houthi strikes started to affect all British, U.S., and Israeli [shipping vessels in the Red Sea](#) in December 2023, these U.S. cargoes to Asia diverted again around the Cape of Good Hope, which is only three days longer than the route through the Suez Canal and the Bab el-Mandeb.⁴¹
 - The Red Sea shipping disruptions have significantly affected northbound oil flows, mostly from crude oil, diesel, and jet fuel going from the Middle East and western India to Europe, and they have forced some of these cargoes to re-route around the Cape of Good Hope. Europe began to import more crude oil and oil product cargoes through the Bab el-Mandeb and the Suez Canal in 2022 when sanctions on Russia took effect. However, current Red Sea disruptions are driving many ships to divert their course around Africa and are resulting in Europe importing more oil from the United States.⁴² Between December 2023 and February 2024, at least 444,000 b/d of crude oil from the Middle East, mostly Iraq, and at least 455,000 b/d of oil products from India and the Middle East were sent around the Cape of Good Hope instead of through the Bab el-Mandeb and Suez Canal.⁴³
 - Saudi Arabia is the only Middle Eastern country able to bypass the Bab el-Mandeb Strait and export crude oil to Europe from its Red Sea terminals. Saudi Arabia's western Yanbu port exported a record high amount of crude oil to the Sumed pipeline at Ain Sukhna in Egypt for further transit to the Mediterranean Sea in February 2024.⁴⁴
 - Unlike the northbound crude oil flows to Europe and the United States, the Red Sea disruption has affected southbound oil flows from Russia to the Middle East and Asia far less.⁴⁵
 - All LNG cargoes through the Bab el-Mandeb in both directions stopped as of February 2024.⁴⁶ Qatar stopped sending LNG vessels northbound through the Red Sea in mid-January 2024 and are transporting all LNG flows to Europe around the Cape of Good Hope.⁴⁷ Likewise, U.S. LNG vessels going to Asia are taking other routes as well, and Russia began to re-route some of its southbound LNG cargoes from Arctic terminals to Asia around the Cape of Good Hope in January 2024.⁴⁸

Figure 7. Map of Arabian Peninsula maritime chokepoints



Data source: U.S. Energy Information Administration

Table 4. Volume of crude oil, condensate, and petroleum products transported through the Suez Canal, SUMED pipeline, and Bab el-Mandeb Strait (2018–2023)
million barrels per day

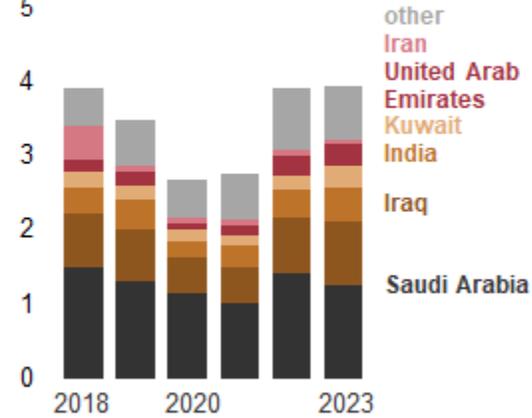
	2018	2019	2020	2021	2022	2023
Total oil flows through the Suez Canal and SUMED pipeline	6.4	6.2	5.3	5.1	7.3	8.6
Crude oil and condensate	3.4	3.1	2.6	2.2	3.6	4.4
Petroleum products	3.0	3.1	2.7	2.9	3.7	4.3
LNG flows through the Suez Canal (billion cubic feet per day)	3.3	4.1	3.7	4.5	4.5	4.0
Total oil flows through Bab el-Mandeb Strait	6.4	6.0	5.2	5.4	7.5	8.6
Crude oil and condensate	3.2	2.8	2.4	2.2	3.7	4.3
Petroleum products	3.1	3.2	2.8	3.2	3.8	4.4
LNG flows through Bab el-Mandeb Strait (billion cubic feet per day)	3.1	3.9	3.7	4.5	4.5	4.0

Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

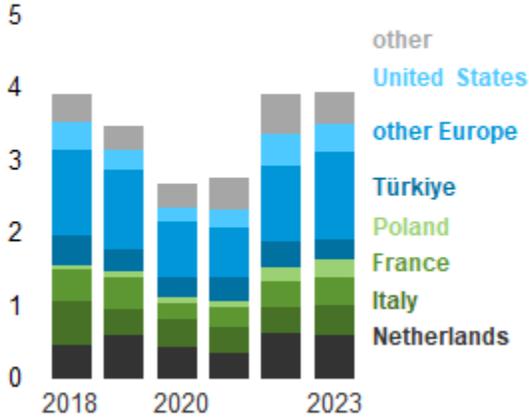
Note: LNG=liquefied natural gas

Figure 8. Northbound crude oil and petroleum product volumes transiting Suez Canal and SUMED pipeline (2018–2023)

million barrels per day
by origin



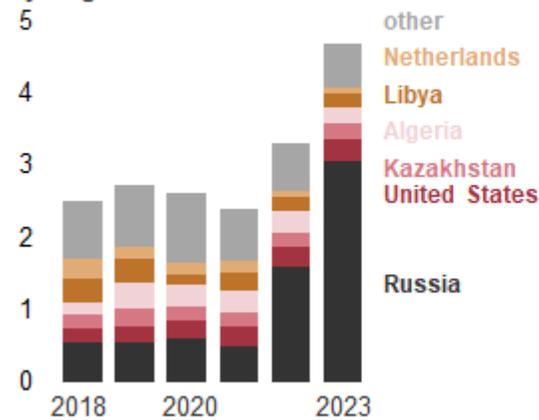
million barrels per day
by destination



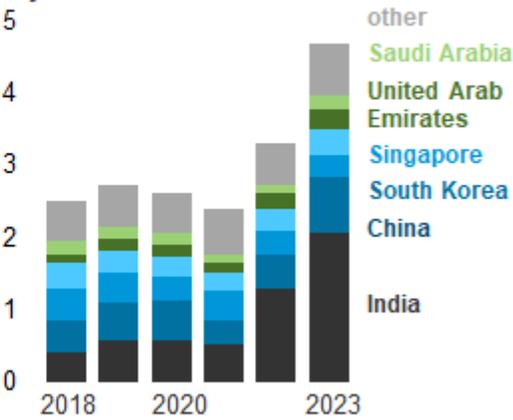
Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Figure 9. Southbound crude oil and petroleum product volumes transiting Suez Canal (2018–2023)

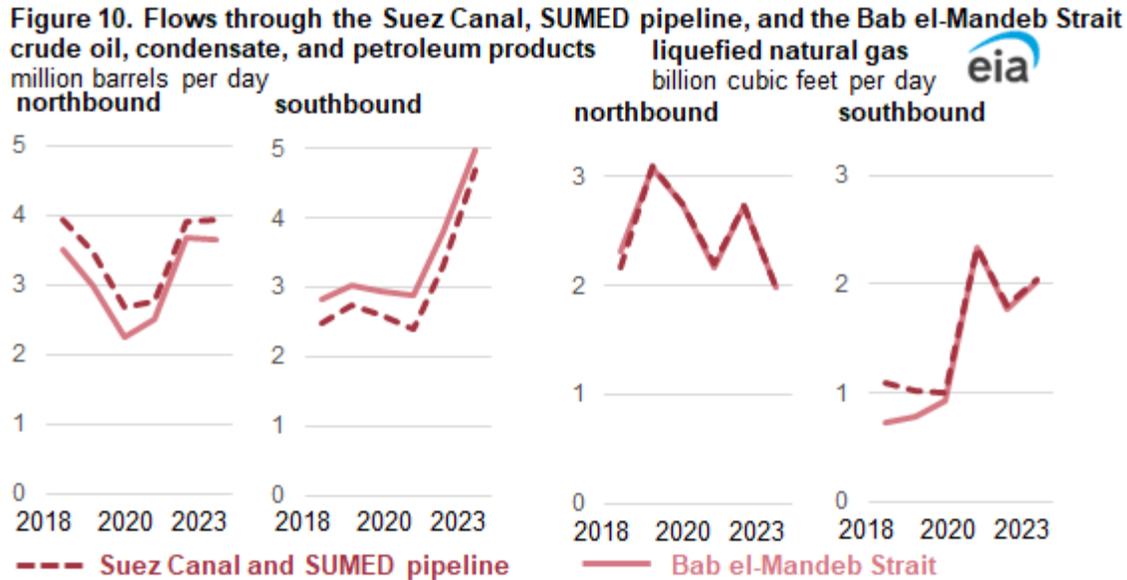
million barrels per day
by origin



million barrels per day
by destination



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Danish Straits

- The Danish Straits are a series of channels that connect the Baltic Sea to the North Sea (Figure 11).
- Historically, the Danish Straits were an important route for Russia's seaborne oil exports to Europe before global trade patterns shifted following Russia's full-scale invasion of Ukraine in early 2022 and subsequent sanctions on Russia's oil exports by Western countries.⁴⁹
- An estimated 4.9 million b/d of crude oil and petroleum products flowed through the Danish Straits in 2023, almost 60% higher than in 2021 because of this shift in trade flow from Russia. (Table 5).⁵⁰ Although Russia remained the largest oil exporter through the Danish Straits in 2023, it shipped most of these volumes from the Baltic Sea through the Danish Straits to Asia, Türkiye, the Middle East, and Africa instead of to western Europe and the United States. Russia's oil exports to India rose rapidly in 2023 as India took advantage of the lower prices offered by Russia compared with the Middle East and other producers (Figure 12).⁵¹ Oil flows from Russia included around 114,000 b/d of crude oil from Kazakhstan, which began to distinguish its own oil from Russia's crude oil grades in mid-2022.⁵²
- Starting in 2022, oil flows crossing the western side of the Danish Straits from countries such as the United States, Norway, the United Kingdom, and Egypt to countries east of the straits, such as Poland and Finland, rose and replaced oil imports from Russia to these countries.
- LNG flows through the Danish Straits more than doubled from 0.5 Bcf/d in 2022 to 1.3 Bcf/d in 2023 (Table 5). The United States became the largest supplier to countries east of the Danish Straits in 2021 as U.S. LNG export infrastructure grew rapidly during the past few years.⁵³ Much of these volumes replaced Europe's pipeline imports from Russia starting in 2022.⁵⁴ Russia added the 72-Bcf/y floating Portovaya LNG export terminal to the Baltic Sea in mid-2022 and increased its exports through the Danish Straits in 2023.⁵⁵

- The Kiel Canal in northern Germany provides an alternative route to the Danish Straits; however, it serves small tankers, and virtually only oil products are shipped through it (Figure 11). Oil flows through the canal fell from 267,000 b/d in 2019 to 220,000 b/d in 2023. Russia used to be the largest source of oil products flowing through the canal, but its share drastically fell after sanctions were imposed in 2022. At the same time, the Netherlands, Belgium, and Denmark began to transport more oil products through the canal.⁵⁶

Figure 11. Map of the Danish Straits



Data source: U.S. Energy Information Administration

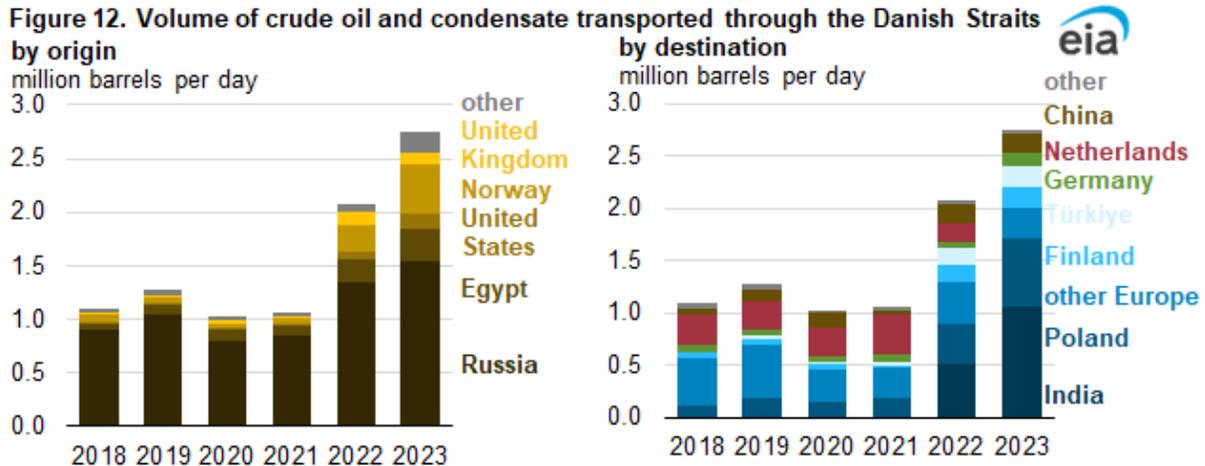
Table 5. Volume of crude oil, condensate, and petroleum products transported through the Danish Straits (2018–2023)

million barrels per day

	2018	2019	2020	2021	2022	2023
Total oil flows through the Danish Straits	3.3	3.4	3.1	3.1	4.2	4.9
Crude oil and condensate	1.1	1.3	1.0	1.1	2.1	2.7
Petroleum products	2.2	2.1	2.1	2.0	2.1	2.2
Total oil flows through the Kiel Canal	0.3	0.3	0.2	0.2	0.2	0.2
LNG flows through the Danish Straits (billion cubic feet per day)	0.2	0.5	0.5	0.5	0.5	1.3

Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Note: LNG=liquefied natural gas



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Turkish Straits

- The Turkish Straits, which includes the Bosphorus and Dardanelles waterways (also known as the Istanbul Strait and the Çanakkale Strait, respectively), divide Asia from Europe (Figure 13). The Bosphorus is a 17-nautical mile waterway that connects the Black Sea with the Sea of Marmara. The Dardanelles is a 37-nautical mile waterway that links the Sea of Marmara with the Aegean and Mediterranean Seas. Both waterways are in Türkiye and supply Asia, western Europe, and southern Europe with oil from Russia and the Caspian Sea region.⁵⁷
- Less than half a nautical mile wide at the narrowest point,⁵⁸ the Turkish Straits are among the world's most difficult waterways to navigate because of their sinuous geography. About 42,000 vessels transited the straits in 2022, making this area one of the world's busiest maritime chokepoints.⁵⁹
- Commercial ships have the right of free passage through the Turkish Straits in peacetime. However, Türkiye regulates the straits for safety and environmental purposes.⁶⁰ Türkiye also has the right to close the straits to warships per the Montreux Convention of 1936. In February 2022 after Russia's full-scale invasion of Ukraine, Türkiye restricted the straits from warships of all countries except for those returning to a base in the Black Sea.⁶¹
- An estimated 3.4 million b/d of crude oil and petroleum products flowed through the Turkish Straits in 2023. Slightly more than half of this volume was crude oil, and the remainder was oil products (Table 6).⁶² Black Sea ports are one of the primary export routes for both crude oil and oil products from Russia and other Eurasian countries, including Azerbaijan and Kazakhstan (Figure 14).
- Oil shipments through the Turkish Straits decreased from 3.5 million b/d in 2019 to less than 3.3 million b/d in 2020 because of the lower global oil demand from the COVID-19 pandemic. They then decreased further to less than 3.2 million b/d in 2022 because of Russia's full-scale invasion of Ukraine. The invasion reduced Ukraine's exports of oil through the Turkish Straits by around 100,000 b/d between 2021 and 2023. Oil flows from Azerbaijan through the straits also fell during the same time frame.⁶³
- However, total oil flows through the straits increased to more than 3.4 million b/d by 2023 as Russia began to send more oil from the Black Sea to Türkiye, China, and India. Because of

- sanctions, Russia diverted some of its Urals crude oil grade exports from pipelines traveling to Europe to ships moving from the Baltic Sea and Black Sea.⁶⁴
- The only alternative for crude oil to circumvent the Turkish Straits is through the Baku-Tbilisi-Ceyhan pipeline from Azerbaijan in the Caspian Sea to the port of Ceyhan in Türkiye. The Iraq-to-Türkiye pipeline from the Kurdistan region in northern Iraq, another alternative, has been out of operation since March 2023.⁶⁵
 - Türkiye does not allow LNG cargoes to pass through the Bosphorus Strait because of safety issues, but they can traverse the Strait of Dardanelles.⁶⁶ Türkiye has one regasification terminal, Marmara LNG, located in the Sea of Marmara inside the Strait of Dardanelles, so LNG carriers travel eastbound through the Dardanelles to reach the Marmara LNG terminal. In 2023, Marmara LNG imported around 170 Bcf of natural gas, mostly from the United States and Algeria.⁶⁷
 - If a disruption occurred at the Strait of Dardanelles, Türkiye could still receive natural gas through its other LNG import terminals, which are located outside of this strait, or import natural gas via pipeline from Azerbaijan or Russia.⁶⁸

Figure 13. Map of Turkish Straits chokepoints



Data source: U.S. Energy Information Administration

Table 6. Volume of crude oil, condensate, and petroleum products transported through the Turkish Straits (2018–2023)

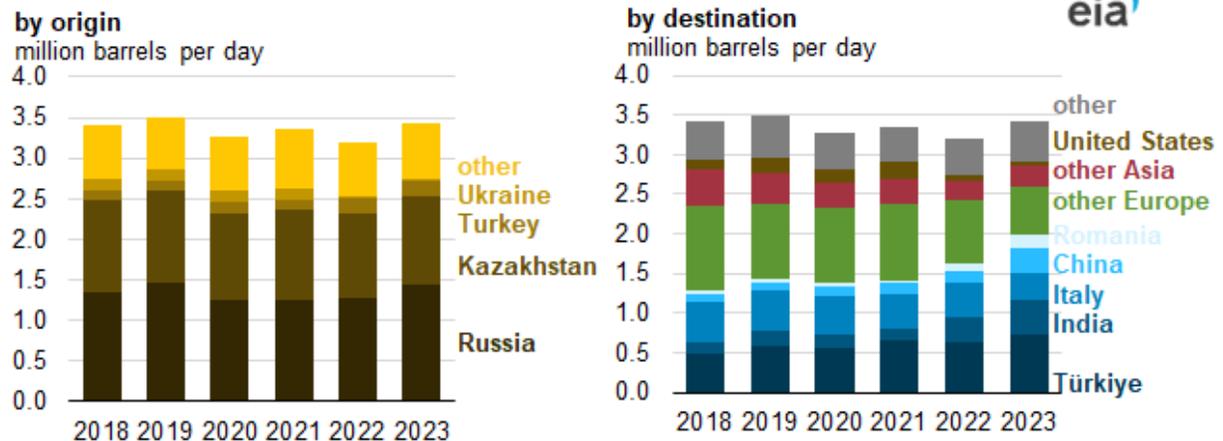
million barrels per day

	2018	2019	2020	2021	2022	2023
Total oil flows through the Bosphorus Strait	3.2	3.3	3.0	3.0	2.9	3.2
Crude oil and condensate	1.8	1.9	1.6	1.7	1.7	1.8
Petroleum products	1.4	1.5	1.4	1.4	1.3	1.4
Total oil flows through the Dardanelles Strait	3.4	3.5	3.3	3.4	3.2	3.4
Crude oil and condensate	1.9	1.9	1.8	1.8	1.8	1.9
Petroleum products	1.5	1.6	1.5	1.5	1.4	1.5
LNG flows through the Dardanelles Strait (billion cubic feet per day)	0.4	0.5	0.6	0.6	0.6	0.5

Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Note: LNG=liquefied natural gas

Figure 14. Volume of total oil transported through the Dardanelles Strait



Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Panama Canal

- The Panama Canal connects the Pacific Ocean with the Caribbean Sea and the Atlantic Ocean. The canal is 50 miles long, and its narrowest point is the Culebra Cut (nearly 9 miles long) at the Continental Divide (Figures 15 and 16).⁶⁹
- Alternatives to the Panama Canal include the Straits of Magellan, Cape Horn, and Drake Passage at the southern tip of South America, but these routes would significantly increase transit times and costs, adding up to 8,000 miles of travel or, in the case of going around

- South America, would involve traversing dangerous waterways.⁷⁰ Other routes include going eastward around the Cape of Good Hope in South Africa or through the Suez Canal.
- The Trans-Panama Pipeline is an alternative route to the Panama Canal for crude oil transportation. It is located near the border with Costa Rica and runs from the Port of Chiriqui Grande in Bocas del Toro, Panama, on the Caribbean Sea to the Port of Charco Azul on the Pacific coast. The pipeline has a capacity of 864,000 b/d of crude oil,⁷¹ and the pipeline transported more than 300,000 b/d in 2023, up from about 260,000 b/d in 2022.⁷²
 - In mid-2016, the Panama Canal Authority, which operates the Panama Canal, inaugurated a [major expansion of the canal](#). The expansion allows for four more transits per day and accommodates slightly larger vessels compared with the older set of locks.⁷³
 - Although only 3% of total global maritime petroleum and petroleum product flows went through the Panama Canal in 2023, the waterway is an important route for petroleum products and LNG traveling from the U.S. Gulf Coast to western South America and to Asia.⁷⁴ Crude oil, petroleum products, and LNG represented 48% of commodities that transited through the Panama Canal from the Atlantic Ocean to the Pacific Ocean in October 2022–September 2023 (FY 2023).⁷⁵
 - Almost 2.1 million b/d of petroleum and other liquids were transported through the canal in FY 2023; more than 2.0 million b/d were refined oil products, and the remainder was crude oil (Table 7).⁷⁶ Most global crude oil travels on vessels that are too large to navigate the Panama Canal, despite the 2016 expansion, but refined products typically move on smaller ships.⁷⁷
 - Exports of hydrocarbon gas liquids (HGLs), especially propane, from the United States to Asia have increased significantly since 2012 as U.S. production of HGLs rose and Asia's petrochemical sector developed. U.S. ethane exports to China, which began in 2019, were more than 200,000 b/d in 2023.⁷⁸ The shortest and preferred route for tankers carrying HGLs to East Asia from the U.S. Gulf Coast is through the Panama Canal.⁷⁹
 - Total oil flows through the Panama Canal fell in 2023 because a [drought lowered water levels at Gatún Lake, which limited ship traffic through the canal](#) (Table 7).⁸⁰ Water levels at Gatún Lake, which supplies water to operate the canal lock system, dropped from about 87 feet at the beginning of 2023 to below 80 feet from June through October 2023, one of the [lowest levels since at least 1965](#). Water levels remained below 82 feet at the beginning of 2024.⁸¹ Ship constraints at the Panama Canal led to long delays and higher freight rates for vessels carrying liquefied petroleum gas (LPG) in the second half of 2023.⁸²
 - According to Vortexa ship tracking data, many [LPG and LNG vessels traveling from the U.S. Gulf Coast to Asia re-routed through the Suez Canal or around the Cape of Good Hope](#) at the southern tip of Africa in the latter months of 2023. [Diverting U.S. Gulf Coast-to-Japan LPG and LNG cargoes away from the Panama Canal](#), which is a 27-day trip, increases the journey to 44 days through the Suez Canal or at least 48 days around the Cape of Good Hope (Figure 17).⁸³ The Red Sea attacks by Houthi forces in Yemen that began in November 2023 have further diverted LPG and LNG cargoes from the Atlantic Basin to Asia; most now avoid the Suez Canal and mostly take the Cape of Good Hope route instead.⁸⁴
 - Panama Canal restrictions reduced diesel and gasoline flows from the U.S. Gulf Coast to western South America at the end of 2023 and the beginning of 2024. This disruption led to trade shifts: more Asian distillate exports went to western South America and more U.S. distillate exports went to Europe.⁸⁵
 - The United States began exporting liquefied natural gas (LNG) in 2016 from the Gulf Coast, mostly to Asia and Europe.⁸⁶ U.S. LNG exports to Asia travel through the Panama Canal

because it is the fastest route to ship LNG cargoes from the U.S. Gulf Coast. Total export volumes rose significantly to Europe and Asia, particularly East Asia, through 2021.⁸⁷ During the winter of 2020–2021, cold weather drove up LNG consumption in Asia, which caused congestion and delays at the Panama Canal and forced some LNG carriers to take longer routes. In FY 2022, LNG cargoes through the Panama Canal declined to almost 640 Bcf from around 910 Bcf in FY 2021. The United States shifted some of its LNG shipments from Asia to Europe in 2022 after natural gas supply from Russia to Europe dropped significantly. LNG flows through the Panama Canal declined again in FY 2023 to about 560 Bcf because of the transit issues caused by low water levels at the canal.⁸⁸

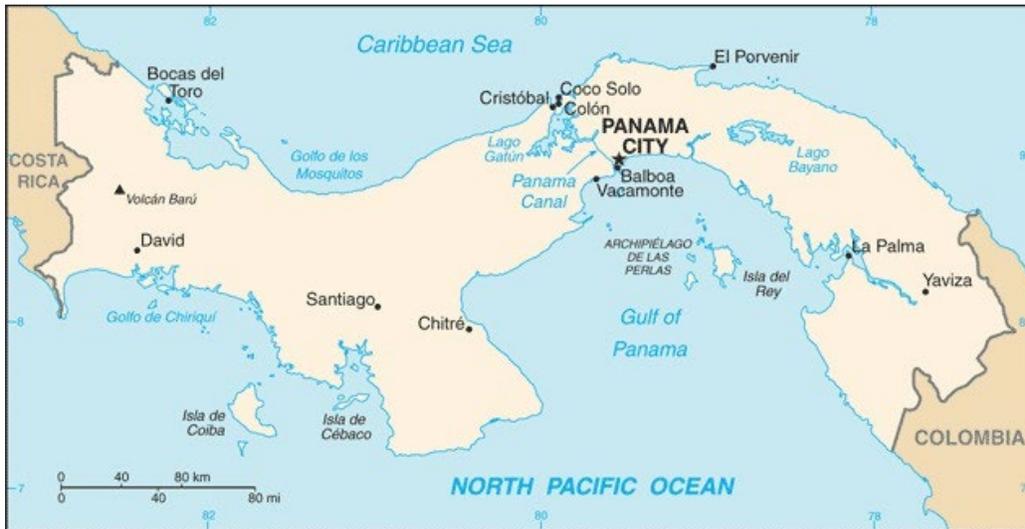
Table 7. Panama Canal oil flows, 2018–2023 (fiscal years)
million barrels per day

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Panama Canal total flows						
Total oil	1.4	1.5	1.7	1.8	2.1	2.1
Crude oil	0.1	0.1	0.2	0.1	0.1	0.1
Refined products	1.3	1.3	1.6	1.7	1.9	2.0
Panama Canal southbound flows						
Total oil	1.3	1.3	1.5	1.7	2.0	2.0
Crude oil	0.1	0.1	0.1	0.1	0.1	0.1
Refined products	1.2	1.2	1.4	1.6	1.8	1.9
Panama Canal northbound flows						
Total oil	0.1	0.1	0.2	0.1	0.1	0.1
Crude oil	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Refined products	0.1	0.1	0.1	0.1	0.1	0.1
Trans-Panama Pipeline (calendar year)	0.2	0.2	0.3	0.3	0.3	0.3

Data source: Panama Canal Authority (with EIA conversions and calculations)⁸⁹

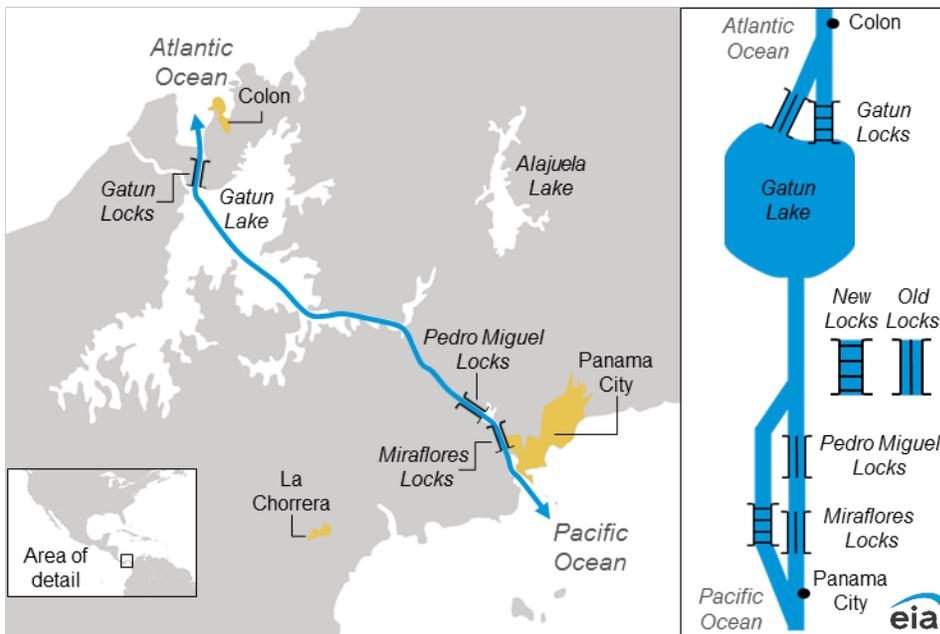
Note: Totals may not equal the sum of the components due to independent rounding. Data for the Panama Canal are by fiscal year (October 1 to September 30).

Figure 15. Map of Panama



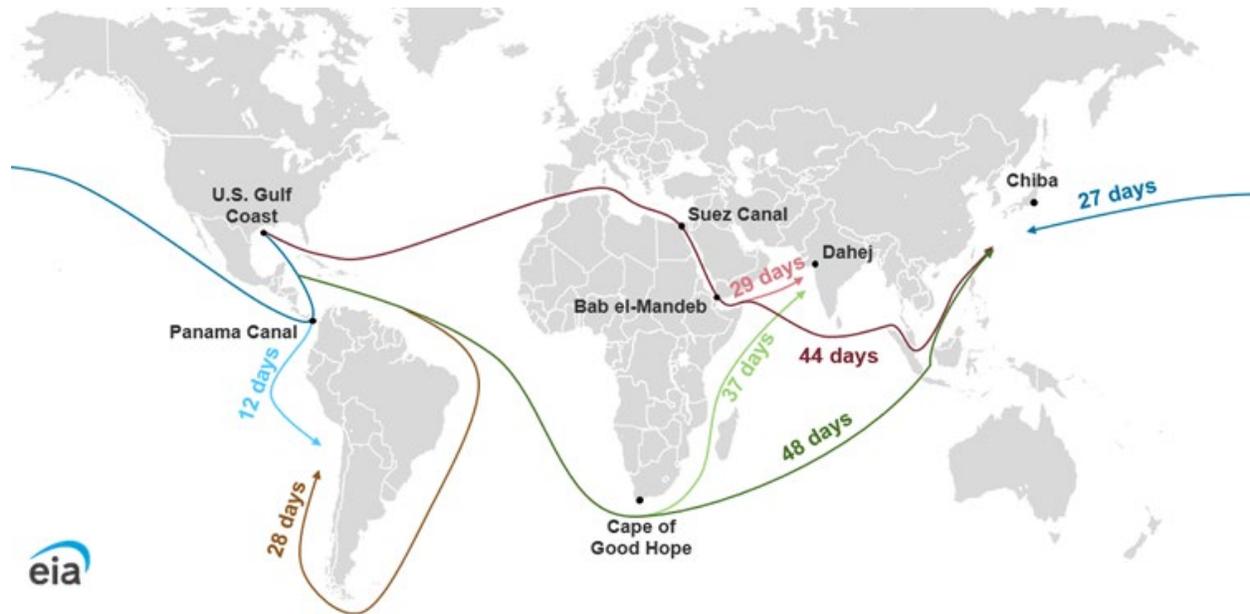
Data source: Central Intelligence Agency, World Factbook

Figure 16. Panama Canal and Lock System (May 2024)



Data source: U.S. Energy Information Administration

Figure 17. Shipping routes from U.S. Gulf Coast to Asia and western South America



Data source: U.S. Energy Information Administration using calculations from Vortexa tanker tracker

Note: Voyage time is calculated for laden Very Large Gas Carriers traveling at 14 knots without extended chokepoint delays.

Cape of Good Hope

- Although not a chokepoint, the Cape of Good Hope, located on the southern tip of South Africa, is a major global trade route and a significant transit point for oil tanker shipments around the world. Crude oil flows around the Cape accounted for about 8% of all seaborne-traded oil in 2023.
- We estimate about 5.0 million b/d of seaborne-traded crude oil went around the cape in both directions in 2023 (Table 8), with most volumes traveling eastbound to Asian markets (nearly 4.7 million b/d). More than 40% of the imports traversing the cape went to China. Most of the crude oil flows going around the cape originated from the United States (32%), West Africa (31%), and South America (including the Caribbean) (27%).⁹⁰
- Crude oil and condensate volumes going around Africa dropped by nearly 1.6 million b/d between 2020 and 2022.⁹¹ A combination of factors drove this decline—lower imports into Asia, especially China, because of the impact of the COVID-19 pandemic on oil imports; lower oil output levels from West African producers who would send their shipments to Asia; and more of Russia’s oil cargoes replacing cargoes from the Americas to India starting in 2022.
- The cape is an alternative sea route for vessels traveling westward that want to bypass the Gulf of Aden, Bab el-Mandeb Strait, and the Suez Canal. However, diverting vessels around the cape increases costs and shipping time. For example, closure of the Suez Canal and the SUMED Pipeline would require oil tankers to divert around the cape, adding approximately 15 days to transit from the Arabian Sea to Europe, which would increase cost and delay shipments.⁹²

- Drought and restrictions at the Panama Canal during 2023 and disruptions at the Bab el-Mandeb Strait and Red Sea starting in November 2023 have re-routed many oil and natural gas vessels to take the longer route around the cape and avoid these chokepoints. For these reasons, we expect that energy flows around the cape to rise in both directions in 2024 if the disruptions continue.

Table 8. Volume of crude oil, condensate, and petroleum products transported around the Cape of Good Hope (2018–2023)

million barrels per day

	2018	2019	2020	2021	2022	2023
Total oil flows around the cape	7.6	7.5	7.7	7.0	5.9	6.0
Crude oil and condensate	6.5	6.4	6.4	5.7	4.9	5.0
Petroleum products	1.1	1.1	1.3	1.3	1.1	1.0
LNG flows around the cape (billion cubic feet per day)	2.6	2.4	3.4	3.2	1.5	2.0

Data source: U.S. Energy Information Administration analysis based on Vortexa tanker tracking

Note: LNG=liquefied natural gas

¹ U.S. Energy Information Administration, *Short-Term Energy Outlook*, May 2024.

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