U.S. Energy Information Administration

‹ Countries

World Oil Transit Chokepoints

Last Updated: November 10, 2014 (Notes)

full report

Overview

World chokepoints for maritime transit of oil are a critical part of global energy security. About 63% of the world's oil production moves on maritime routes. The Strait of Hormuz and the Strait of Malacca are the world's most important strategic chokepoints by volume of oil transit.

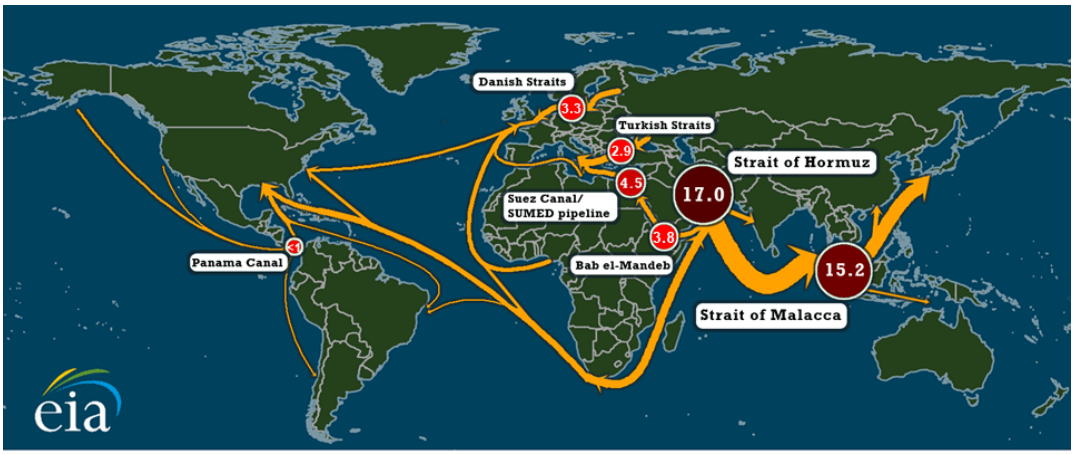
The U.S. Energy Information Administration (EIA) defines world oil chokepoints as narrow channels along widely-used global sea routes, some so narrow that restrictions are placed on the size of the vessel that can navigate through them. Chokepoints are a critical part of global energy security because of the high volume of petroleum and other liquids transported through their narrow straits.

In 2013, total world petroleum and other liquids production was about 90.1 million barrels per day (bbl/d).[1] EIA estimates that about 63% of this amount (56.5 million bbl/d) traveled via seaborne trade.[2] Oil tankers accounted for 30% of the world's shipping by deadweight tonnage in 2013, according to data from the United Nations Conference on Trade and Development (UNCTAD).[3]

International energy markets depend on reliable transport routes. Blocking a chokepoint, even temporarily, can lead to substantial increases in total energy costs and world energy prices. Chokepoints also leave oil tankers vulnerable to theft from pirates, terrorist attacks, shipping accidents that can lead to disastrous oil spills, and political unrest in the form of wars or hostilities.

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. 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 alternate route to certain chokepoints.

Figure 1. Daily transit volumes through world maritime oil chokepoints



All estimates in million barrels per day. Includes crude oil and petroleum products. Based on 2013 data.

Sources: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Panama Canal Authority, Eastern Bloc Research, Suez Canal Authority, and UNCTAD, using EIA conversion factors.

Table 1. Volume of crude oil and petroleum products transported through world chokepoints, 2009-13

Location	2009	2010	2011	2012	2013
Strait of Hormuz	15.7	15.9	17.0	16.9	17.0
Strait of Malacca	13.5	14.5	14.6	15.1	15.2
Suez Canal and SUMED Pipeline	3.0	3.1	3.8	4.5	4.6
Bab el-Mandab	2.9	2.7	3.4	3.7	3.8
Danish Straits	3.0	3.2	3.3	3.1	3.3
Turkish Straits	2.8	2.8	3.0	2.9	2.9
Panama Canal	0.8	0.7	0.8	0.8	0.8
World maritime oil trade	**53.9**	**55.5**	**55.6**	**56.7**	**56.5**
World total oil supply	**84.9**	**87.5**	**87.8**	**89.7**	**90.1**

Notes: All estimates are in million barrels per day. Data for Panama Canal is by fiscal years.
Sources: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Panama Canal Authority, Eastern Bloc Research, Suez Canal Authority, and UNCTAD, using EIA conversion factors.

Oil tanker sizes

Ships carrying crude oil and petroleum products are limited by size restrictions imposed by maritime oil chokepoints. The global crude oil and refined product tanker fleet uses a classification system to standardize contract terms, to establish shipping costs, and to determine the ability of ships to travel into ports or through certain straits and channels. This

system, known as the Average Freight Rate Assessment (AFRA) system, was established by Royal Dutch Shell six decades ago, and is overseen by the London Tanker Brokers' Panel (LTBP), an independent group of shipping brokers.

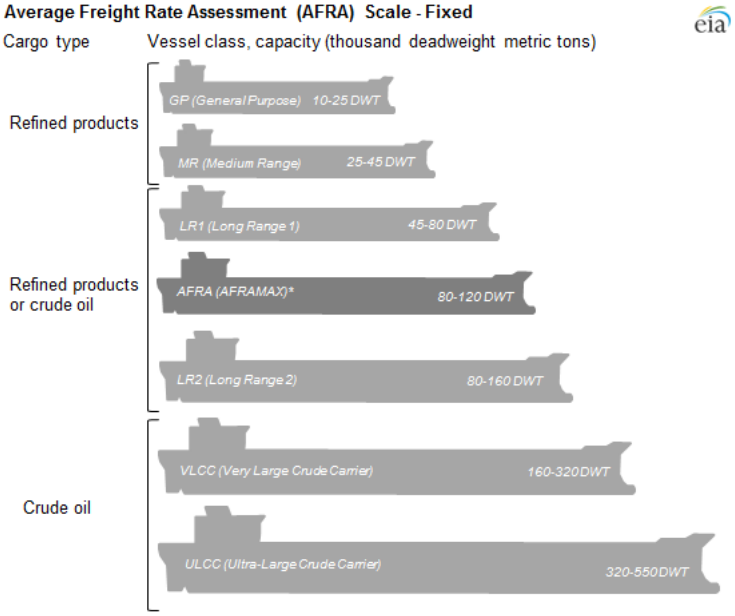
AFRA uses a scale that classifies tanker vessels according to deadweight tons, a measure of a ship's capacity to carry cargo. The approximate capacity of a ship in barrels is determined using an estimated 90% of a ship's deadweight tonnage, and multiplying that by a barrel per metric ton conversion factor specific to each type of petroleum product and crude oil, as liquid fuel densities vary by type and grade.

The smaller vessels on the AFRA scale - the General Purpose (GP) and Medium Range (MR) tankers - are commonly used to transport cargos of refined petroleum products over relatively shorter distances, such as from Europe to the U.S. East Coast. Their smaller size allows them to access most ports around the globe. A GP tanker can carry between 70,000 barrels and 190,000 barrels of motor gasoline (3.2-8 million gallons), and an MR tanker can carry between 190,000 barrels and 345,000 barrels (8-14.5 million gallons).

Long Range (LR) class ships are the most common ships in the global tanker fleet, as they are used to carry both refined products and crude oil. These ships can access most large ports that ship crude oil and petroleum products. An LR1 tanker can carry between 345,000 barrels and 615,000 barrels of gasoline (14.5-25.8 million gallons) or between 310,000 barrels and 550,000 barrels of light sweet crude oil.

A classification used to describe a large portion of the global tanker fleet is AFRAMAX. AFRAMAX vessels refer to ships between 80,000 deadweight tons and 120,000 deadweight tons. This ship size is popular with oil companies for logistical purposes, so, many ships have been built within these specifications. Because the AFRAMAX range exists somewhere between the LR1 and LR2 AFRA scales, the LTBP does not publish a freight assessment specifically for AFRAMAX vessels.

Over the history of AFRA, vessels grew in size, and newer classifications were added. The Very Large Crude Carrier (VLCC) and Ultra-Large Crude Carrier (ULCC) were added as the global oil trade expanded and 95 larger vessels provided better economics for crude shipments. VLCCs are responsible for most crude oil shipments around the globe, including in the North Sea, home of the crude oil price benchmark Brent. A VLCC can carry between 1.9 million and 2.2 million barrels of a West Texas Intermediate (WTI) type crude oil.



Source: U.S. Energy Information Administration, London Tanker Brokers' Panel[5]

Note: AFRAMAX is not an official vessel classification on the AFRA scale but is shown here for comparison.

Strait of Hormuz

The Strait of Hormuz is the world's most important chokepoint with an oil flow of 17 million barrels per day in 2013, about 30% of all seaborne-traded oil.

Located between Oman and Iran, the Strait of Hormuz connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. The Strait of Hormuz is the world's most important oil chokepoint because of its daily oil flow of 17 million barrels per day in 2013. Flows through the Strait of Hormuz in 2013 were about 30% of all seaborne-traded oil.

EIA estimates that more than 85% of the crude oil that moved through this chokepoint went to Asian markets, based on data from Lloyd's List Intelligence tanker tracking service.[6] Japan, India, South Korea, and China are the largest destinations for oil moving through the Strait of Hormuz.

Qatar exported about 3.7 trillion cubic feet (Tcf) per year of liquefied natural gas (LNG) through the Strait of Hormuz in 2013, according to BP's Statistical Review of World Energy 2014.[7] This volume accounts for more than 30% of global LNG trade. Kuwait imports LNG volumes that travel northward through the Strait of Hormuz.

At its narrowest point, the Strait of Hormuz is 21 miles wide, but the width of the shipping lane in either direction is only two miles wide, separated by a two-mile buffer zone. The Strait of Hormuz is deep and wide enough to handle the world's largest crude oil tankers, with

about two-thirds of oil shipments carried by tankers in excess of 150,000 deadweight tons.

Pipelines available as bypass options

Most potential options to bypass Hormuz are currently not operational. Only Saudi Arabia and the United Arab Emirates (UAE) presently have pipelines able to ship crude oil outside of the Persian Gulf and have additional pipeline capacity to circumvent the Strait of Hormuz. At the end of 2013, the total available unused pipeline capacity from the two countries combined was approximately 4.3 million bbl/d (see Table 2).

Saudi Arabia has the 746-mile Petroline, also known as the East-West Pipeline, which runs across Saudi Arabia from its Abqaiq complex to the Red Sea. The Petroline system consists of two pipelines with a total nameplate (installed) capacity of about 4.8 million bbl/d. The 56-inch pipeline has a nameplate capacity of 3 million bbl/d, and its current throughput is about 2 million bbl/d. The 48-inch pipeline had been operating in recent years as a natural gas pipeline, but Saudi Arabia converted it back to an oil pipeline. The switch increased Saudi Arabia's spare oil pipeline capacity to bypass the Strait of Hormuz from 1 million bbl/d to 2.8 million bbl/d, but this is only achievable if the system operates at its full nameplate capacity.

Saudi Arabia also operates the Abqaiq-Yanbu natural gas liquids pipeline, which has a capacity of 290,000 bbl/d. However, this pipeline is currently running at capacity and cannot move any additional oil.

The UAE operates the Abu Dhabi Crude Oil Pipeline (1.5 million bbl/d) that runs from Habshan, a collection point for Abu Dhabi's onshore oil fields, to the port of Fujairah on the Gulf of Oman, allowing crude oil shipments to circumvent the Strait of Hormuz. The pipeline can transport more than half of UAE's total net oil exports. The government plans to increase this capacity in the near future to 1.8 million bbl/d.

Figure 2. Map of the Strait of Hormuz

Source: U.S. Government (See full map for alternate routes)

Other pipelines are currently unavailable as bypass options

Saudi Arabia also has two additional pipelines that run parallel to the Petroline system and bypass the Strait of Hormuz, but neither of the pipelines currently has the ability to transport additional volumes of oil if the Strait of Hormuz is closed.

The 1.65 million bbl/d, 48-inch Iraqi Pipeline in Saudi Arabia (IPSA), which runs parallel to the Petroline from pump station #3 (there are 11 pumping stations along the Petroline) to the port of Mu'ajjiz, just south of Yanbu, Saudi Arabia, was built in 1989 to carry 1.65 million bbl/d of crude oil from Iraq to the Red Sea. The pipeline closed indefinitely following the August 1990 Iraqi invasion of Kuwait. In June 2001, Saudi Arabia seized ownership of IPSA and converted it to transport natural gas to power plants. Saudi Arabia has not announced plans to convert the pipeline back to transport crude oil.

Other pipelines, such as the Trans-Arabian Pipeline (TAPLINE) running from Qaisumah in Saudi Arabia to Sidon in Lebanon, or a strategic oil pipeline between Iraq and Turkey, have been out of service for years because of war damage, disuse, or political disagreements. These pipelines would require extensive renovation before they can transport oil. Relatively small quantities, several hundred thousand barrels per day at most, could also be transported by truck if the Strait of Hormuz is closed.

Table 2. Operating pipelines that bypass the Strait of Hormuz, 2013

Pipeline name	Country	Status	Capacity	Throughput	Unused capacity
Petroline (East-West Pipeline)	Saudi Arabia	Operating	4.8	2.0	2.8
Abu Dhabi Crude Oil Pipeline	United Arab Emirates	Operating	1.5	0.6	0.9
Abqaiq-Yanbu Natural Gas Liquids Pipeline	Saudi Arabia	Operating	0.3	0.3	0.0
Iraqi Pipeline in Saudi Arabia (IPSA)	Saudi Arabia	*Converted to* natural gas	1.7	-	-
Total			**8.2**	**2.9**	**3.7**

Notes: All estimates expressed in million barrels per day (bbl/d). Unused Capacity is defined as pipeline capacity that is not currently utilized but can be readily available.
Sources: U.S. Energy Information Administration, Lloyd's List Intelligence.[8]

Strait of Malacca

The Strait of Malacca, linking the Indian Ocean and the Pacific Ocean, is the shortest sea route between the Middle East and growing Asian markets.

The Strait of Malacca, located between Indonesia, Malaysia, and Singapore, links the Indian Ocean to the South China Sea and Pacific Ocean. The Strait of Malacca is the shortest sea

route between Persian Gulf suppliers and the Asian markets—notably China, Japan, South Korea, and the Pacific Rim.

Oil shipments through the Strait of Malacca supply China and Indonesia, two of the world's fastest-growing economies. It is the key chokepoint in Asia, with an estimated 15.2 million bbl/d flow in 2013, compared with 13.5 million bbl/d in 2009. Crude oil generally makes up about 90% of total oil flows per year, and petroleum products make up about 10% (see Table 3).

At its narrowest point in the Phillips Channel of the Singapore Strait, the Strait of Malacca is only about 1.7 miles wide, creating a natural bottleneck with potential for collisions, grounding, or oil spills.[9] 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, although the number of attacks has dropped since 2005 after nearby countries increased patrols in the area.[10]

If the Strait of Malacca were blocked, nearly half of the world's fleet would be required to reroute around the Indonesian archipelago, such as through the Lombok Strait between the Indonesian islands of Bali and Lombok, or the Sunda Strait between Java and Sumatra.[11] Rerouting would tie up global shipping capacity, adding to shipping costs and potentially having a significant impact on energy prices.

There have been several proposals to build bypass options and reduce tanker traffic through the Strait of Malacca. In particular, China and Burma (Myanmar) commissioned the Myanmar-China natural gas pipeline in 2013 that stretches from Myanmar's ports in the Bay of Bengal to the Yunnan province of China. The pipeline has a capacity of 424 billion cubic feet per year. The countries are constructing a parallel oil pipeline to serve as an alternative transport route for crude oil imports from the Middle East to potentially bypass the Strait of Malacca.[12] The oil pipeline was set to open in late 2014 and to have a capacity of about 440,000 bbl/d, according to IHS Energy.[13] However, political opposition in both countries to the pipeline may delay its opening until 2016.

The Strait of Malacca is also an important transit route for liquefied natural gas from Persian Gulf and African suppliers, particularly Qatar, to East Asian countries with growing LNG demand. The biggest importers of LNG in the region are Japan and South Korea.

Table 3. Strait of Malacca oil and liquefied natural gas (LNG) flows

million barrels per day	2009	2010	2011	2012	2013
Total oil flows through Strait of Malacca	13.5	14.5	14.6	15.1	15.2
crude oil	11.9	12.8	12.9	13.3	13.4
refined products	1.6	1.7	1.7	1.8	1.8
LNG (Tcf per year)	1.6	1.9	2.5	3.2	4.2

Notes: Tcf = Trillion cubic feet. 2013 LNG is a preliminary estimate.
Sources: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Cedigaz, BP.[14]

Figure 3. Map of the Strait of Malacca

Source: CIA Factbook (See closer view of Strait of Malacca)

Suez Canal/SUMED Pipeline

The Suez Canal and SUMED Pipeline are strategic routes for Persian Gulf oil and natural gas shipments to Europe and North America. These two routes combined accounted for about 8% of the world's seaborne oil trade in 2013.

Suez Canal

The Suez Canal is located in Egypt and connects the Red Sea and Gulf of Suez with the Mediterranean Sea. In 2013, total petroleum and other liquids (crude oil and refined products) and LNG accounted for 20% and 3% of total Suez cargoes, measured by cargo tonnage, respectively. The Suez Canal is unable to handle Ultra Large Crude Carriers (ULCC) and fully laden Very Large Crude Carriers (VLCC) class crude oil tankers. The Suezmax was the largest ship capable of navigating through the canal until 2010 when the Suez Canal Authority extended the canal depth to 66 feet to allow more than 60% of all tankers to use the Suez Canal, according to the Suez Canal Authority.[15]

In 2013, nearly 3.2 million bbl/d of total oil (crude oil and refined products) transited the Suez Canal in both directions, according to the Suez Canal Authority. This is the largest amount ever shipped through the Suez Canal. The majority of the oil was sent northbound (1.9 million bbl/d) toward European and North American markets, and the remainder was sent southbound (1.3 million bbl/d), mainly toward Asian markets.

Oil exports from Persian Gulf countries (Saudi Arabia, Iraq, Kuwait, United Arab Emirates, Iran, Oman, Qatar, and Bahrain) accounted for 79% of Suez Canal northbound oil flows. The largest importers of northbound oil flows through the Suez Canal in 2013 were European countries (68%) and the United States (16%). Oil exports from European countries made up the majority (66%) of Suez southbound oil flows, followed by North Africa (Algeria and Libya combined made up 16%). The largest importers of Suez southbound oil flows through the Suez Canal were Asian countries (74%).

Total traffic through the Suez Canal fell in 2009, and total oil flows dropped to 1.8 million bbl/d, their lowest level in recent years. The decrease in oil flows during that time reflected the collapse in world oil market demand that began in the fourth quarter of 2008, followed by OPEC production cuts (primarily from the Persian Gulf), which caused a sharp fall in regional oil trade starting in early 2009. Egypt's 2011 revolution did not have any noticeable effect on oil transit flows through the Suez Canal. Over the past few years, oil flows through the Suez Canal have increased, recovering from previous lower levels during the global economic downturn.

SUMED Pipeline

The 200-mile long SUMED Pipeline, or Suez-Mediterranean Pipeline, transports crude oil through Egypt from the Red Sea to the Mediterranean Sea. The crude oil flows through two parallel pipelines that are 42 inches in diameter, with a total pipeline capacity of 2.34 million bbl/d. Oil flows north starting at the Ain Sukhna terminal along the Red Sea coast to its end point at the Sidi Kerir terminal on the Mediterranean Sea. SUMED is owned by the Arab Petroleum Pipeline Co., a joint venture between the Egyptian General Petroleum Corporation (50%), Saudi Aramco (15%), Abu Dhabi's International Petroleum Investment Company (15%), multiple Kuwaiti companies (15%), and Qatar Petroleum (5%).[16]

The SUMED Pipeline is the only alternative route to transport crude oil from the Red Sea to the Mediterranean Sea if ships were unable to navigate through the Suez Canal. Closure of the Suez Canal and the SUMED Pipeline would necessitate diverting oil tankers around the southern tip of Africa, the Cape of Good Hope, adding approximately 2,700 miles to transit from Saudi Arabia to the United States, increasing both costs and shipping time, according to the U.S. Department of Transportation.[17] According to the International Energy Agency (IEA), shipping around Africa would add 15 days of transit to Europe and 8-10 days to the United States.[18]

Fully laden VLCCs going toward the Suez Canal also use the SUMED Pipeline for lightering. Lightering occurs when a vessel needs to reduce its weight and draft by offloading cargo to enter a restrictive waterway, such as a canal. The Suez Canal is not deep enough for a fully-laden VLCC and, therefore, a portion of the crude is offloaded at the SUMED Pipeline at the Ain Sukhna terminal. The now partially-laden VLCC goes through the Suez Canal and picks up the offloaded crude at the other end of the pipeline at the Sidi Kerir terminal.

In 2013, 1.4 million bbl/d of crude oil was transported through the SUMED Pipeline to the Mediterranean Sea, which was then loaded onto a tanker for seaborne trade. SUMED crude

flows decreased over the past few years, but the decrease has been offset by more oil transiting northbound via the Suez Canal. Total oil flows via SUMED and the Suez Canal were 4.6 million bbl/d in 2013, 0.1 million bbl/d higher compared with the previous year. Total oil flows via the Suez Canal and SUMED pipeline accounted for about 8% of total seaborne-traded oil in 2013.

Table 4. Suez Canal and SUMED pipeline flows of oil and liquefied natural gal (LNG)

million barrels per day	2009	2010	2011	2012	2013
Total oil flows via the Suez Canal and SUMED pipeline	**3**	**3.1**	**3.8**	**4.5**	**4.6**
Suez Canal total flows					
crude oil	0.6	0.7	0.7	1.4	1.5
refined products	1.3	1.3	1.4	1.6	1.7
total oil	**1.8**	**2**	**2.2**	**3**	**3.2**
LNG (Tcf per year)	**0.8**	**1.6**	**2.1**	**1.5**	**1.2**
Suez northbound flows					
crude oil	0.3	0.4	0.5	0.9	1.1
refined products	0.7	0.7	0.9	0.8	0.7
total oil	**1**	**1.2**	**1.4**	**1.7**	**1.9**
LNG (Tcf per year)	**0.8**	**1.5**	**1.8**	**1.2**	**1**
Suez southbound flows					
crude oil	0.3	0.3	0.2	0.5	0.4
refined products	0.6	0.5	0.6	0.8	1
total oil	**0.9**	**0.8**	**0.8**	**1.3**	**1.3**
LNG (Tcf per year)	**0.1**	**0.1**	**0.2**	**0.3**	**0.2**
SUMED pipeline crude oil flows	**1.2**	**1.1**	**1.7**	**1.5**	**1.4**

Notes: Totals may not exactly match corresponding values as a result of independent rounding. Tcf = Trillion cubic feet.

Source: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Suez Canal Authority (with EIA conversions).[19]

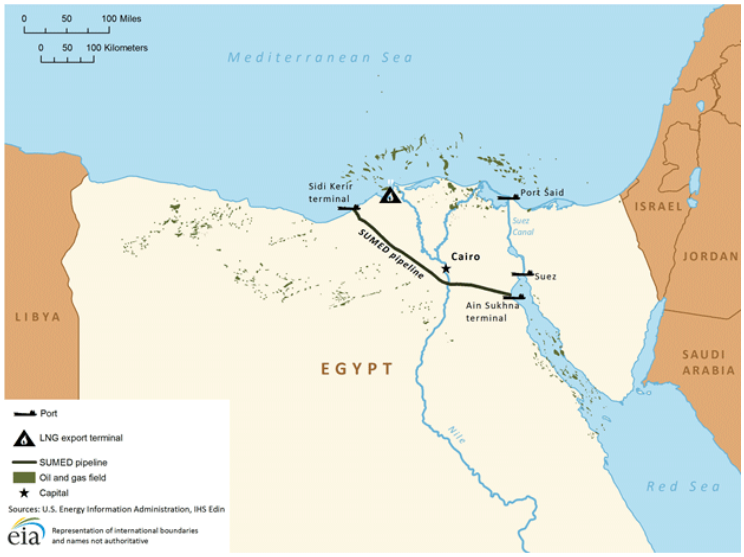
Liquefied natural gas (LNG)

LNG flows through the Suez Canal in both directions were 1.2 Tcf in 2013, accounting for 10% of total LNG transported worldwide.

LNG flows through the Suez Canal in both directions were 1.2 Tcf in 2013, accounting for around 10% of total LNG traded worldwide. Southbound LNG transit mostly originates in Egypt and Algeria and is largely destined for Asian markets, while northbound transit is mostly from Qatar mainly destined for European markets. The rapid growth in LNG flows through the Suez Canal after 2008 represents the use of multiple LNG trains in Qatar in 2009-10.

LNG flows through the Suez Canal in both directions have declined from their peak of almost 2.1 Tcf in 2011. The decrease mostly reflects the fall in northbound LNG flows and is consistent with LNG import data for the United States and Europe, which show that total LNG imports into both areas decreased, particularly from Qatar. U.S. LNG imports from Qatar fell by 63% from 2011-2012 and again by 78% in 2013. The changes reflect growing domestic natural gas production in the United States, a decrease in LNG demand in some European countries, and strong competition for LNG in the global market. As a result, total Suez LNG flows as a share of total LNG traded worldwide fell to 10% in 2013, compared with 18% in 2011.

Figure 4. Map of Suez Canal/SUMED pipeline



Source: U.S. Energy Information Administration, IHS EDIN.

Bab el-Mandeb

Closing the Bab el-Mandeb Strait could keep tankers in the Persian Gulf from reaching the Suez Canal and the SUMED Pipeline, diverting them around the southern tip of Africa.

The Bab el-Mandeb Strait is a chokepoint between the Horn of Africa and the Middle East, and it is a strategic link between the Mediterranean Sea and the Indian Ocean. The strait is located between Yemen, Djibouti, and Eritrea, and connects the Red Sea with the Gulf of Aden and the Arabian Sea. Most exports from the Persian Gulf that transit the Suez Canal and SUMED Pipeline also pass through Bab el-Mandeb.

An estimated 3.8 million bbl/d of crude oil and refined petroleum products flowed through this waterway in 2013 toward Europe, the United States, and Asia, an increase from 2.9 million bbl/d in 2009. Oil shipped through the strait decreased by almost one-third in 2009 because of the global economic downturn and the decline in northbound oil shipments to Europe. Northbound oil shipments increased through Bab el-Mandeb Strait in 2013, and more than half of the traffic, about 2.1 million bbl/d, moved northbound to the Suez Canal and SUMED Pipeline.

The Bab el-Mandeb Strait is 18 miles wide at its narrowest point, limiting tanker traffic to two 2-mile-wide channels for inbound and outbound shipments. Closure of the Bab el-Mandeb could keep tankers from the Persian Gulf from reaching the Suez Canal or SUMED Pipeline, diverting them around the southern tip of Africa, adding to transit time and cost. In addition, European and North African southbound oil flows could no longer take the most direct route to Asian markets via the Suez Canal and Bab el-Mandeb.

Figure 5. Map of Bab el-Mandeb

Source: CIA Factbook (See closer view of Bab el-Mandeb)

Turkish Straits

Increased oil exports from the Caspian Sea region make the Turkish Straits one of the busiest chokepoints in the world. Oil through these straits supplies Western and Southern Europe.

The Turkish Straits, which includes the Bosporus and Dardanelles waterways, divide Asia from Europe. The Bosporus is 17-mile waterway that connects the Black Sea with the Sea of

Marmara. The Dardanelles is a 40-mile waterway that links the Sea of Marmara with the Aegean and Mediterranean Seas.[20] Both are located in Turkey and supply Western and Southern Europe with oil from Russia and the Caspian Sea Region.

An estimated 2.9 million bbl/d flowed through the Turkish Straits in 2013. About 70% of this volume was crude oil and the remainder was petroleum products. These Black Sea ports are among the primary oil export routes for Russia and other Eurasian countries, including Azerbaijan and Kazakhstan.

Oil shipments through the Turkish Straits decreased from more than 3.4 million bbl/d at its peak in 2004 to 2.6 million bbl/d in 2006 as Russia shifted crude oil exports toward the Baltic ports. Traffic through the Turkish Straits increased from 2010-2011 as crude production and exports from Azerbaijan and Kazakhstan increased.

Only half a mile wide at the narrowest point, the Turkish Straits are among the world's most difficult waterways to navigate because of their sinuous geography. About 48,000 vessels transit the straits each year, making this area one of the world's busiest maritime chokepoints.[21]

Commercial shipping has the right of free passage through the Turkish Straits in peacetime, although Turkey claims the right to impose regulations for safety and environmental purposes. Bottlenecks and heavy traffic also create problems for oil tankers in the Turkish Straits. Turkey has raised concerns over the navigational safety and environmental threats to the Turkish Straits, and the country has suggested that an alternate route could be developed between the Black Sea and the Sea of Marmara.[22]

Figure 6. Map of Turkish Straits

Source: U.S. Government (See closer view of Turkish Straits)

Panama Canal

The United States is the primary country of origin and destination for all commodities going through the Panama Canal; however, it is not a significant route for U.S. petroleum trade.

The Panama Canal is an important route connecting the Pacific Ocean with the Caribbean Sea and the Atlantic Ocean. The Canal is 50 miles long and only 110 feet wide at its narrowest point â the Culebra Cut â at the Continental Divide.[23] More than 13,000 vessels transited the Canal in fiscal year 2014, representing more than 200 million tons of cargo.[24] Goods either originating from or destined for the United States accounted for 43% of the total shipments passing through the Panama Canal during that period.[25]

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 about 8,000 miles of travel.

Although petroleum and petroleum products represented 18% of the principal commodities that crossed through the Panama Canal,[26] it is not a significant route for global petroleum and petroleum product transit. In 2013, 1.4% of total global maritime petroleum and petroleum product flows went through the Panama Canal. According to the Panama Canal Authority, 877,000 bbl/d of petroleum and petroleum products were transported through the canal in fiscal year 2014, of which 748,000 bbl/d were refined products, the remainder being crude oil.[27] About 78% of total petroleum, 688,000 bbl/d, went southbound from the Atlantic to the Pacific.[28]

The relevance of the Panama Canal to the global oil trade has diminished, as many modern tankers are too large to travel through the canal. Some oil tankers, such as the ULCC (Ultra Large Crude Carrier) class tankers, can be nearly five times larger than the maximum capacity of the canal. The largest vessel that can transit the Panama Canal is known as a Panamax-size vessel (ships ranging from 60,000 to 80,000 deadweight tons and no wider than 106 ft).

To make the canal more accessible, the Panama Canal Authority undertook an expansion program planned to be completed by 2015. The expansion will be able to accommodate a fully loaded Aframax tanker at 120,000 deadweight tons,[29] but will not be able to accommodate carriers the size of VLCCs or larger. The Panama Canal Authority website features a description of the expansion program and progress reports.

Table 5. Panama Canal and Trans-Panama Pipeline oil flows, 2009-13

thousand barrels per day	2009	2010	2011	2012	2013
Panama Canal total flows					
total oil	788	741	755	802	849
crude oil	176	110	119	118	91
refined products	612	630	637	684	759

Panama Canal southbound flows					
total oil	588	566	600	687	708
crude oil	116	53	68	71	39
refined products	471	514	532	616	669
Panama canal northbound flows					
total oil	200	174	156	115	141
crude oil	60	57	51	47	51
refined products	140	117	105	68	90

Notes: Tcf = Trillion cubic feet. 2013 LNG is a preliminary estimate.
Sources: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Panama Canal Authority (with EIA conversions).[30]

Figure 7. Map of Panama Canal

Source: CIA Factbook (See closer view of Panama Canal)

Trans-Panama Pipeline

The Trans-Panama Pipeline (TPP), operated by Petroterminal de Panama, S.A. (PTP), is located outside the former Canal Zone near the Costa Rican border. It runs from the port of Charco Azul on the Pacific coast to the port of Chiriqui Grande in Bocas del Toro, Panama on the Caribbean Sea. The pipeline began operating in 1982, with the original purpose of facilitating crude oil shipments from Alaska's North Slope to refineries in the Caribbean and in the U.S. Gulf Coast.[31] However, in 1996, the TPP was shut down as oil companies began shipping Alaskan crude along alternative routes. Since 1996, there have been intermittent requests and proposals to use the TPP. In August 2009, the TPP completed a project to reverse its flows so the pipeline could transport oil from the Caribbean to the Pacific. The pipeline's capacity is about 600,000 bbl/d.[32]

In 2012, BP and PTP signed a seven-year transportation and storage agreement, allowing BP to lease storage facilities located on the Caribbean and Pacific coasts of Panama and to use the pipeline to transport crude oil to U.S. West Coast refiners. According to PTP, BP has leased 5.4 million barrels of PTP's storage and committed to east-to-west shipments through the pipeline averaging 100,000 bbl/d. The route reduces transport time and costs of ships having to go around Cape Horn at the southern tip of South America to get to the U.S. West Coast.[33]

According to Lloyd's List Intelligence, 95,000 bbl/d of crude oil was transported through the pipeline to the port of Charco Azul in 2013, an increase of more than 20,000 bbl/d from the previous year.

Danish Straits

The Danish Straits are an important route for Russian oil exports to Europe.

The Danish Straits consist of a series of channels that connect the Baltic Sea to the North Sea. They are an important route for Russian oil exports to Europe. An estimated 3.3 million bbl/d of crude oil and petroleum products flowed through the Danish Straits in 2013.

Russia shifted a significant portion of its crude oil exports to its Baltic ports after opening the port of Primorsk in 2005. In 2011, Primorsk oil exports accounted for more than half of all exports through the Danish Straits, although the volume fell to 42% in 2013. A small amount of oil (less than 100,000 bbl/d), primarily from Norway and the United Kingdom, also flowed eastward to Scandinavian markets in 2013.

Figure 8. Map of Danish Straits

Source: CIA Factbook

Cape of Good Hope

Although not a chokepoint, the Cape of Good Hope is a major global trade route. Crude oil flows around the Cape accounted for about 9% of all seaborne-traded oil.

The Cape of Good Hope, located on the southern tip of South Africa, is a significant transit point for oil tanker shipments around the globe. EIA estimates about 4.9 million bbl/d of seaborne-traded crude oil moved around the Cape of Good Hope in both directions in 2013, accounting for about 9% of all seaborne-traded oil. EIA does not currently estimate petroleum product flows around the Cape of Good Hope.

In 2013, 3.6 million bbl/d of crude oil around the world moved eastbound, originating mostly from Africa (2.1 million bbl/d) and from South America and the Caribbean (1.3 million bbl/d). Eastbound crude oil flows were nearly all destined for Asian markets (3.5 million bbl/d). In the opposite direction, nearly all westbound flows originated from the Middle East (1.3 million bbl/d), mostly destined for the Americas, with the United States making up a majority of the total.

The Cape of Good Hope is also an alternative sea route for vessels traveling westward seeking to bypass the Gulf of Aden, Bab el-Mandeb Straits, and/or the Suez Canal. However, diverting vessels around the Cape of Good Hope would increase costs and shipping time. For example, closure of the Suez Canal and the SUMED Pipeline would necessitate diverting oil tankers around the Cape of Good Hope, adding approximately 2,700 miles to transit from Saudi Arabia to the United States, increasing both costs and shipping time, according to the U.S. Department of Transportation.[34]

Table 6. Crude oil transit via the Cape of Good Hope

million bbl/d	2011	2012	2013
Total flows	**4.7**	**5.3**	**4.9**
Eastbound	2.9	3.7	3.6
Westbound	1.7	1.6	1.3

Note: Estimates may not add up to their totals due to differences in rounding.
Source: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence[35]

Notes

- Data presented in the text are the most recent available as of November 10, 2014.
- Data are EIA estimates unless otherwise noted.

Endnotes

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