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COUNTRY ANALYSIS BRIEFS

World Oil Transit Chokepoints

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Background

World oil transit chokepoints are a critical part of global energy security. About half of the world's oil production moves on maritime routes.

Chokepoints are narrow channels along widely used global sea routes, some so narrow that restrictions are placed on the size of vessel that can navigate through them. They are a critical part of global energy security due to the high volume of oil traded through their narrow straits.

Generally used oil tanker terminology	
Tanker Type	**Deadweight Tons**
Panamax	60,000 - 100,000
Aframax	80,000 - 120,000
Suezmax	120,000 - 200,000
VLCC	200,000 - 320,000
ULCC	320,000 +

Source: Clarksons

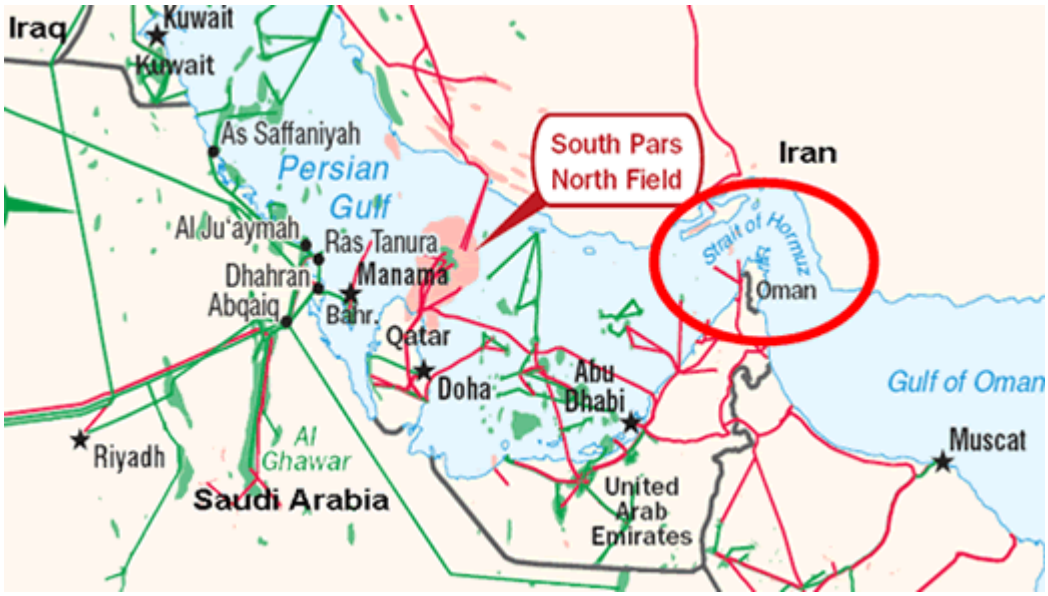
In 2011, total world oil production amounted to approximately 88 million barrels per day (bbl/d), and over one-half was moved by tankers on fixed maritime routes. By volume of oil transit, the Strait of Hormuz leading out of the Persian Gulf and the Strait of Malacca linking the Indian and Pacific Oceans are two of the world's most strategic chokepoints.

The international energy market is dependent upon reliable transport. The blockage of a chokepoint, even temporarily, can lead to substantial increases in total energy costs. In addition, chokepoints leave oil tankers vulnerable to theft from pirates, terrorist attacks, and political unrest in the form of wars or hostilities as well as shipping accidents which can lead to disastrous oil spills.

Strait of Hormuz

The Strait of Hormuz is by far the world's most important chokepoint with an oil flow of almost 17 million barrels per day in 2011.

Located between Oman and Iran, the Strait of Hormuz connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. Hormuz is the world's most important oil chokepoint due to its daily oil flow of almost 17 million barrels in 2011, up from between 15.5-16.0 million bbl/d in 2009-2010. Flows through the Strait in 2011 were roughly 35percent of all seaborne traded oil, or almost 20 percent of oil traded worldwide.



Source: U.S. Government (Click here to zoom out for alternate routes)

On average, 14 crude oil tankers per day passed through the Strait in 2011, with a corresponding

amount of empty tankers entering to pick up new cargos. More than 85 percent of these crude oil exports went to Asian markets, with Japan, India, South Korea, and China representing the largest destinations.

At its narrowest point, the Strait is 21 miles wide, but the width of the shipping lane in either direction is only two miles, separated by a two-mile buffer zone. The Strait 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.

Closure of the Strait of Hormuz would require the use of longer alternate routes at increased transportation costs. Alternate routes include the 745 mile long Petroline, also known as the East-West Pipeline, across Saudi Arabia from Abqaiq to the Red Sea. The East-West Pipeline has a nameplate capacity of about 5 million bbl/d. The Abqaiq-Yanbu natural gas liquids pipeline, which runs parallel to the Petroline to the Red Sea, has a 290,000-bbl/d capacity. Additional oil could also be pumped north via the Iraq-Turkey pipeline to the port of Ceyhan on the Mediterranean Sea, but volumes have been limited by the closure of the Strategic pipeline linking north and south Iraq.

The United Arab Emirates is also completing the 1.5 million bbl/d Abu Dhabi Crude Oil Pipeline pipeline that will cross the emirate of Abu Dhabi and end at the port of Fujairah just south of the Strait. Other alternate routes could include the deactivated 1.65-million bbl/d Iraqi Pipeline across Saudi Arabia (IPSA), and the deactivated 0.5 million-bbl/d Tapline to Lebanon.

Malacca

The Strait of Malacca, linking the Indian and Pacific Oceans 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. 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 13.6 million bbl/d flow in 2009, down slightly from its peak of 14 million bbl/d in 2007.

Source: U.S. Government (Click here to zoom)

At its narrowest point in the Phillips Channel of the Singapore Strait, Malacca is only 1.7 miles wide creating a natural bottleneck, as well as potential for collisions, grounding, or oil spills. According to the International Maritime Bureau's Piracy Reporting Centre, piracy, including attempted theft and hijackings, is a constant threat to tankers in the Strait of Malacca, although the number of attacks has dropped due to the increased patrols by the littoral states authorities since July 2005.

Over 60,000 vessels transit the Strait of Malacca per year. If the strait were blocked, nearly half of the world's fleet would be required to reroute around the Indonesian archipelago through Lombok Strait, located between the islands of Bali and Lombok, or the Sunda Strait, located between Java and Sumatra.

There have been several proposals to build bypasses to reduce tanker traffic through the Strait of Malacca. Construction began in 2009 to build a 240,000 bbl/d crude oil pipeline from Burma to China that could eventually be expanded.

Suez Canal/SUMED Pipeline

Closure of the Suez

Canal and SUMED Pipeline would add an estimated 6,000 miles of transit around the continent of Africa.

Suez Canal

The Suez Canal is located in Egypt, and connects the Red Sea and Gulf of Suez with the Mediterranean Sea, spanning 120 miles. Year-to-date through November of 2010, petroleum (both crude oil and refined products) as well as liquefied natural gas (LNG) accounted for 13 and 11 percent of Suez cargos, measured by cargo tonnage, respectively. Total petroleum transit volume was close to 2 million bbl/d, or just below five percent of seaborne oil trade in 2010.

Almost 16,500 ships transited the Suez Canal from January through November of 2010, of which about 20 percent were petroleum tankers and 5 percent were LNG tankers. With only 1,000 feet at its narrowest point, the Canal is unable to handle the VLCC (Very Large Crude Carriers) and ULCC (Ultra Large Crude Carriers) class crude oil tankers. The Suez Canal Authority is continuing enhancement and enlargement projects on the canal, and extended the depth to 66 ft in 2010 to allow over 60 percent of all tankers to use the Canal.

Source: U.S. Government (Click here to zoom)

Closure of the Suez Canal and the SUMED Pipeline would divert oil tankers around the southern tip of Africa, the Cape of Good Hope, adding approximately 6,000 miles to transit, increasing both costs and shipping time. According to a report released by the International Energy Agency (IEA), shipping around Africa would add 15 days of transit to Europe and 8-10 days to the United States.

SUMED Pipeline

The 200-mile long SUMED Pipeline, or Suez-Mediterranean Pipeline provides an alternative to the Suez Canal for those cargos too large to transit the Canal (laden VLCC's and larger). The pipeline has a capacity of 2.3 million bbl/d and flows north from Ain Sukhna, on the Red Sea coast to Sidi Kerir on the Mediterranean. The SUMED is owned by Arab Petroleum Pipeline Co., a joint venture between the Egyptian General Petroleum Corporation (EGPC), Saudi Aramco, Abu Dhabi's National Oil Company (ADNOC), and Kuwaiti companies.

Source: Oil Capital Ltd.

Crude Oil

The majority of crude oil flows transiting the Canal travel northbound, towards markets in the Mediterranean and North America. Northbound canal flows averaged approximately 428,000 bbl/d in 2010. The SUMED pipeline accounted for 1.15 million bbl/d of crude oil flows along the route over the same period. Combined, these two transit points were responsible for over 1.5 million bbl/d of crude oil flows into the Mediterranean, with an additional 307,000 bbl/d travelling southbound through the Canal. Northbound crude transit represented a decline from 2008 when 940,000 bbl/d of oil transited northbound through the Canal and an additional 2.1 million travelled through the SUMED to the Mediterranean.

Suez Canal Hydrocarbon Traffic (2008 - November 2010)

	2008	2009	2010*
NORTHBOUND			
Crude Oil (bbl/d)	940	314	428
Gasoline	429	379	413
Middle Distillate	150	261	250
Fuel Oil	6	19	6
Naptha	45	1	13
LPG	49	14	24
Other	2	7	20
Total Oil (bbl/d)	**1,621**	**994**	**1,153**
LNG (Bcf)	**316**	**803**	**1,320**
Number of ships			
Tankers	2,089	1,867	1,768
LNG	229	283	393
SOUTHBOUND			
Crude Oil (bbl/d)	211	271	307
Gasoline	165	173	108
Middle Distillate	22	50	27
Fuel Oil	291	188	250
Naptha	63	103	78
LPG	27	38	24
Other	39	27	19
Total Oil (bbl/d)	**818**	**850**	**813**
LNG (Bcf)	**281**	**48**	**97**
Number of ships			
Tankers	1,706	1,612	1,451
LNG	200	242	370
TOTAL			
TOTAL OIL (bbl/d)	**2,440**	**1,843**	**1,966**
Crude	**1,151**	**585**	**735**
Product	**1,288**	**1,258**	**1,232**
LNG (Bcf)	**596**	**852**	**1,416**
TOTAL SHIPS			
Tankers	**3,795**	**3,479**	**3,219**
LNG	**429**	**525**	**763**
SUMED flows (bbl/d)	**2,100**	**1,100**	**1,150**

Source: Suez Canal Authority, converted with EIA conversion factors. SUMED pipeline flows are EIA estimates based on APEX (Lloyd's MIU) Tanker Data.

**2010 information is year-to-date January-November*

Total Oil and Products

Total oil flows from the Suez Canal declined from 2008 levels of over 2.4 million bbl/d in 2008 to just under 2 million bbl/d on average in 2010. Flows through the SUMED experienced a much steeper drop from approximately 2.1 million bbl/d to 1.1 million bbl/d over the same period. The year-on-year difference reflects the collapse in world oil market demand that began in the fourth quarter of 2008 which was then followed by OPEC production cuts (primarily from the Persian Gulf) causing a sharp fall in regional oil trade starting in January 2009. Drops in transit also illustrate the changing dynamics of international oil markets where Asian demand is increasing at a higher rate than European and American markets, while West African crude production is meeting a greater share of the latter's demand. At the same time, piracy and security concerns around the Horn of Africa have led some exporters to travel the extra distance around South Africa to reach western markets.

Liquefied Natural Gas (LNG)

Unlike oil, LNG transit through the Suez Canal has been on the rise since 2008, with the number of tankers increasing from approximately 430 to 760, and volumes of LNG traveling northbound (laden tankers) increasing more than four-fold. Southbound LNG transit originates in Algeria and Egypt, destined for Asian markets while northbound transit is mostly from Qatar and Oman, destined for European and North American markets. The rapid growth in LNG flows over the period represents the startup of five LNG trains in Qatar in 2009-2010. The only alternate route for LNG tankers would be around Africa as there is no pipeline infrastructure to offset any Suez Canal disruptions. Countries such as the United Kingdom and Italy received more than half of their total LNG imports via the Suez Canal in 2009 while over 90 percent of Belgium's LNG imports transited through the canal.

Bab el-Mandab

Closure of the Bab el-Mandab could keep tankers from the Persian Gulf from reaching the Suez Canal/Sumed pipeline complex, diverting them around the southern tip of Africa.

The Strait of Bab el-Mandab is a chokepoint between the horn of Africa and the Middle East, and a strategic link between the Mediterranean Sea and Indian Ocean. It 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 the Bab el-Mandab.

Source: U.S. Government (Click here to zoom)

An estimated 3.2 million bbl/d flowed through this waterway in 2009 (vs. 4 million bbl/d in 2008) toward Europe, the United States, and Asia. The majority of traffic, about 1.8 million bbl/d, moved northbound through the Bab el-Mandab en route to the Suez/SUMED complex.

The Bab el-Mandab is 18 miles wide at its narrowest point, making tanker traffic difficult and limited to two 2-mile-wide channels for inbound and outbound shipments. Closure of the Strait could keep tankers from the Persian Gulf from reaching the Suez Canal or Sumed Pipeline, diverting them around the southern tip of Africa. This would effectively engage spare tanker capacity, and add to transit time and cost.

The Strait of Bab el-Mandab could be bypassed via the East-West oil pipeline, which crosses Saudi Arabia with a nameplate capacity of 4.8 million bbl/d. However, southbound oil traffic would still be blocked. In addition, closure of the Bab el-Mandab would block non-oil shipping from using the Suez Canal, except for limited trade within the Red Sea region.

Security became a concern of foreign firms doing business in the region, after a French tanker was attacked off the coast of Yemen by terrorists in October 2002. In recent years, this region has also seen rising piracy, and Somali pirates continue to attack vessels off the northern Somali coast in the Gulf of Aden and southern Red Sea including the Bab el-Mandab.

Bosporus

Increased oil exports from the Caspian Sea region make the Bosporus Straits one of the busiest and most dangerous chokepoints in the world supplying Western and Southern Europe.

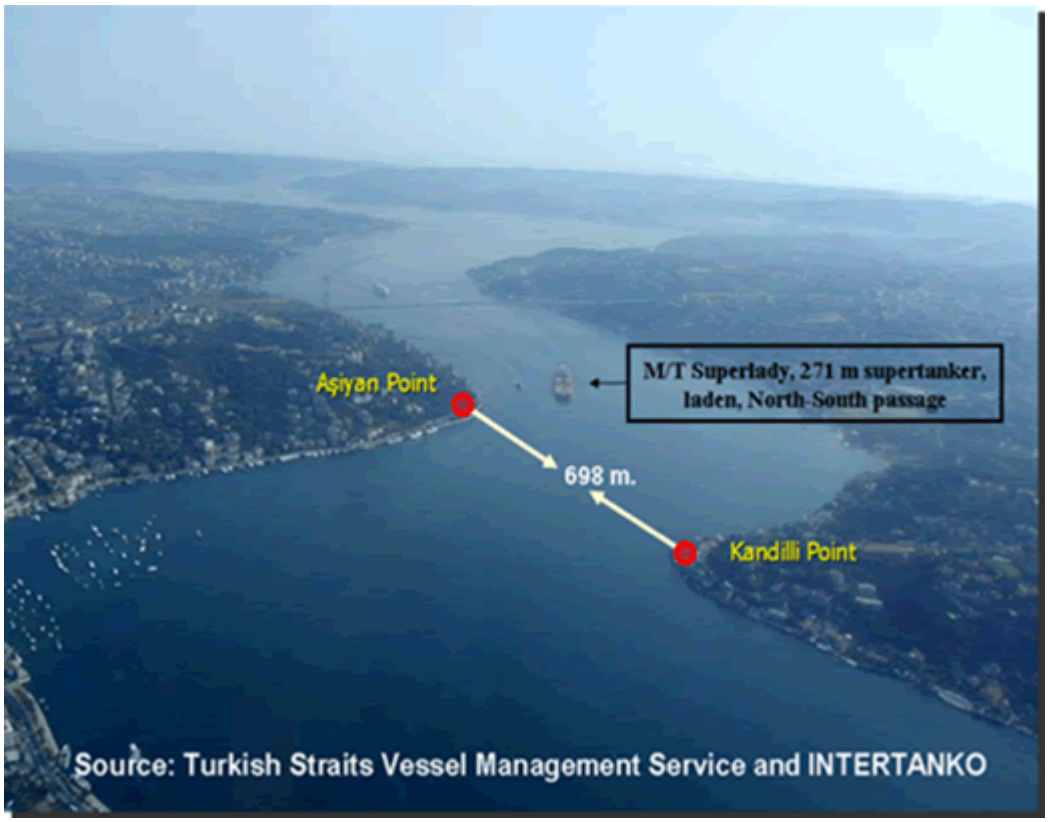
The Bosporus and Dardanelles comprise the Turkish Straits and divide Asia from Europe. The Bosporus connects the Black Sea with the Sea of Marmara, and the Dardanelles links the Sea of Marmara with the Aegean and Mediterranean Seas. The 17-mile long waterway located in Turkey supplies Western and Southern Europe with oil from the Caspian Sea Region.

An estimated 2.9 million bbl/d flowed through this passageway in 2009, of which over 2.5 million bbl/d was crude oil. The ports of the Black Sea are one of the primary oil export routes for Russia and other former Soviet Union republics. Oil shipments through the Turkish Straits decreased from over 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 Straits has increased again as Azerbaijan and Kazakhstan crude production and exports rose.

Source: U.S. Government (Click here to zoom)

Only half a mile wide at its narrowest point, the Turkish Straits are one of the world's most difficult waterways to navigate due to its sinuous geography. With 50,000 vessels, including 5,500 oil tankers, passing through the straits annually it is also one of the world's busiest chokepoints.

Turkey has raised concerns over the navigational safety and environmental threats to the Straits. Commercial shipping has the right of free passage through the Bosporus 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 Bosporus Straits. While there are no current alternate routes for westward shipments from the Black and Caspian Sea region, there are several pipeline projects in various phases of development underway.



Panama Canal

The United States is the primary country of origin and destination for all commodities transiting 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 Atlantic Ocean. The Canal is 50 miles long, and only 110 feet wide at its narrowest point called Culebra Cut on the Continental Divide. Over 14,000 vessels transit the Canal annually, of which more than 60 percent (by tonnage) are for traffic to and from the United States.

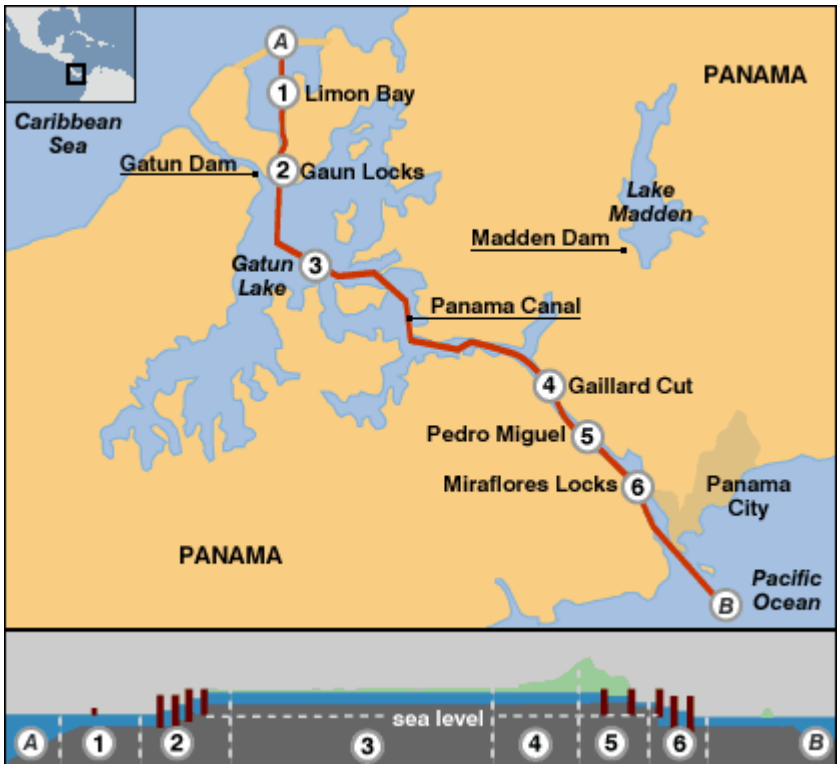
Closure of the Panama Canal would greatly increase transit times and costs adding over 8,000 miles of travel. Vessels would have to reroute around the Straits of Magellan, Cape Horn and Drake Passage over the tip of South America.

However, the Panama Canal is not a significant route for petroleum transit or for U. S. petroleum imports. Roughly one-fifth of the traffic through the canal (measured by both transits and tonnage) was by tankers. According to the Panama Canal Authority, 766,000 bbl/d of crude and petroleum products were transported through the canal in Fiscal Year 2011, of which 645,000 bbl/d were refined products, and the rest crude oil (EIA conversions from long tons to barrels). Most petroleum traffic passed from north (Atlantic) to South (Pacific).

However, 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 Carriers) 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 50,000 – 80,000 dead weight tons in size and no wider than 108 ft.)

In order to make the canal more accessible, the Panama Canal Authority began an expansion program to be completed by end-2014. However, while many larger tankers will be able to transit the canal after 2014, some ULCC's will still be unable to make the transit.

Source: U.S. Government (Click here to zoom)



Source: BBC News

Trans-Panama Pipeline

The Trans-Panama Pipeline (TPP - Petroterminal de Panama, S.A.) is located outside the former Canal Zone near the Costa Rican border and runs from the port of Charco Azul on the Pacific Coast to the port of Chiriquie Grande, Bocas del Toro on the Caribbean. The pipeline was built in 1982, with the original purpose being to facilitate crude oil shipments from Alaska's North Slope to refineries in the Caribbean and the U.S. Gulf Coast. However, in 1996, the TPP was shut down as oil companies began shipping Alaskan crude along alternative routes. Since 1996, there were intermittent requests and proposals to utilize the TPP.In August 2009, TPP completed a project to reverse its flows in order to enable it to carry oil from the Caribbean to the Pacific.

Danish Straits

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

An estimated 3.3 million bbl/d flowed westward through this waterway in 2009 to European markets, up from 2.4 million bbl/d in 2005. Russia has increasingly been shifting its crude oil exports to its Baltic ports, especially the relatively new port of Primorsk, which accounted for half of the exports through the Straits. An additional 0.3 million bbl/d of crude oil, primarily from Norway, flows eastward to Scandinavian markets.

Source: U.S. Government

About one-third of the westward exports through the Straits are for refined products, coming from Baltic Sea ports such as Tallinn (Muuga), Venstpils, and St. Petersburg.

Sources

C.I.A. World Factbook
Eastern Bloc Research
International Maritime Bureau
Lloyd's List Intelligence
Panama Canal Authority
Petroterminal de Panama, S.A.
Suez Canal Authority
U.S. Energy Information Administration

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U.N. Convention on the Law of the Sea

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