

Chapter 1

Oil and LNG Imports and Trade Flow Outlook

November 2016

This chapter should be cited as

ERIA (2016), 'Oil and LNG Imports and Trade Flow Outlook', in Kimura, S., T. Morikawa and S. Singh (eds.), *Sea Lane Security of Oil and Liquefied Natural Gas in the EAS Region*. ERIA Research Project Report 2015-14, Jakarta: ERIA, pp.1-12.

Chapter 1

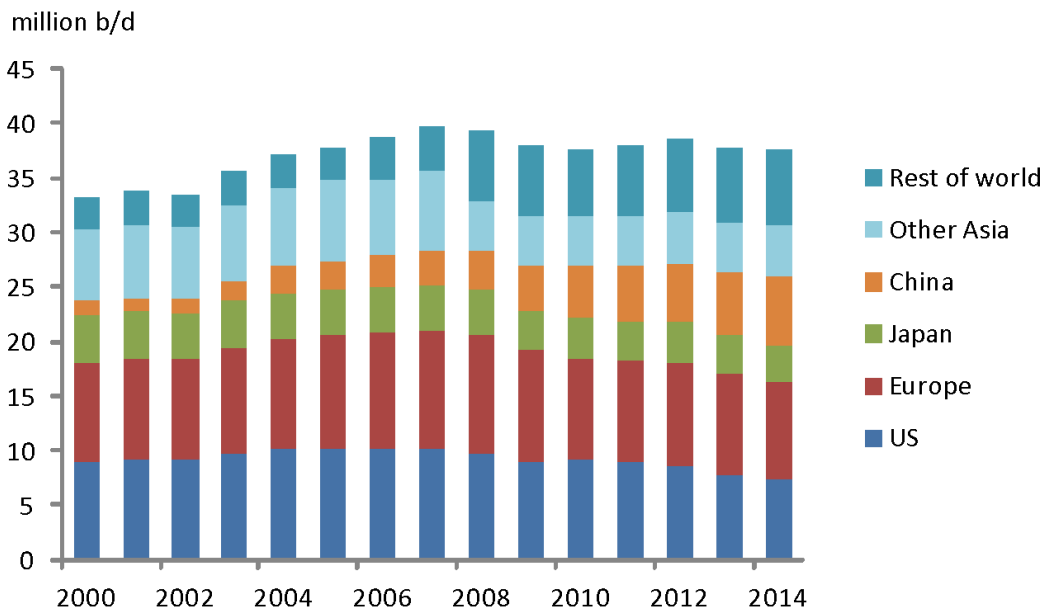
Oil and LNG Imports and Trade Flow Outlook

1. Oil

1.1. Trade

World crude oil trade has increased from 2000 to 2007 by 6.6 million barrels per day (mb/d) backed by strong demand growth in China and the United States (US). The trade volume, however, has declined since then because of the economic downturn caused by the Lehman shock. After 2010, the trade volume was further impacted by US shale oil production growth and rapid fall of US crude oil imports. Persistent economic stagnation in Europe and Japan put additional downwards pressure to their oil demand, and thus reduced their import. On the other hand, imports of China and 'Other Asia' have grown steadily backed by rapid demand increase (Figure 1-1).

Figure 1-1. Crude Oil Imports, by Region (2000–2014)

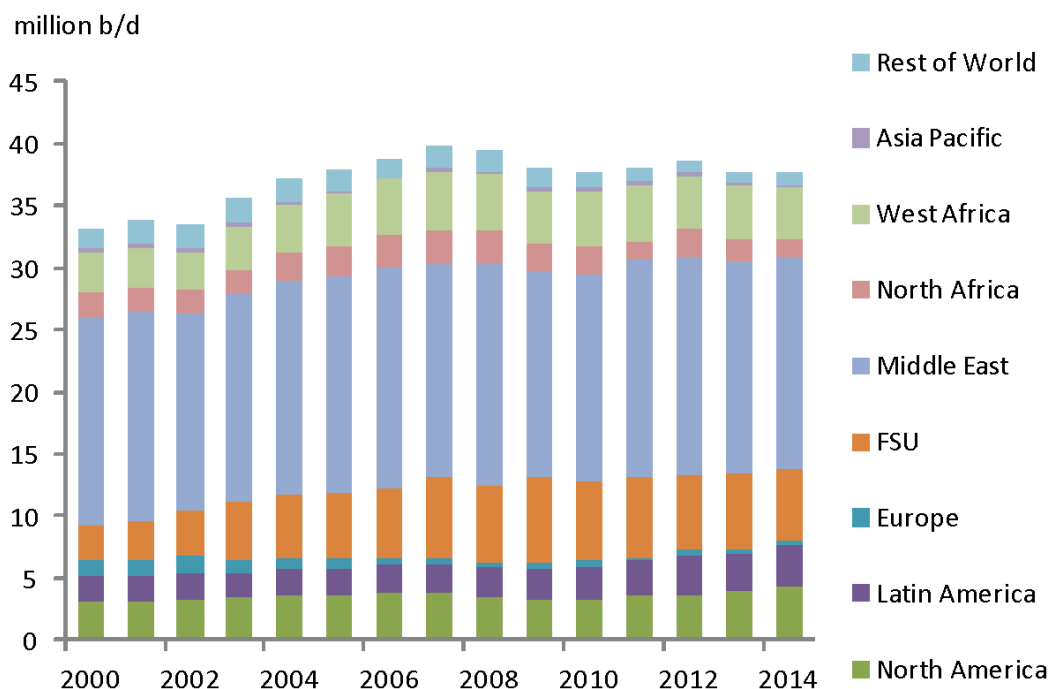


b/d = barrel per day, US = United States.
Source: BP (2015).

As for exports, the Middle East has almost maintained their export volume since 2000 (Figure 1-2). Former Soviet Union (FSU), now Russia, has increased its exports particularly to

the Asian market though Africa and Latin America have failed to maintain their export volume. This is, because in some African countries such as Libya and Nigeria, civil strife or political instability has hindered steady production and exports. As for Latin America, the US used to be the biggest market for their crude oil exports, but tough competition from Canadian crude oil and increased shale oil production in the US significantly narrowed export windows for their crude oil.

Figure 1-2. Crude oil exports by Region (2000–2014)



FSU = Former Soviet Union.
Source: BP (2015).

It is highly likely that oil demand in Asia will continue to grow (Table 1-1). China has led the demand growth in the region since the mid-2000s, and it will remain so with imports of 12 mb/d in 2040, by far the largest in the world. South Asia, importing 9 mb/d and the Association of Southeast Asian Nations (ASEAN), importing 7 mb/d, will also emerge as other demand giants towards 2040. Oil production in Asia- Pacific will either decline or maintain at best, the region will continue to be the major oil importer in the world. Thus, the share of Asia-Pacific in world crude oil imports will increase from 48 percent in 2014 to 71 percent in 2040.

Meanwhile, Asia-Pacific shares only 2 percent of the world crude oil export in 2014, and the share will further decrease towards 2040 due to decline of production in the region (Table 1-2). Europe will be even more negative; the export of which will be negligible in 2030 onwards. The US and Canada are expected to increase their export, thanks to their shale revolution to a certain extent. FSU and Africa will expand their exports gradually too. North

America, FSU, and Africa will contribute to diversify export sources of Asian importers; however, the Middle East will clearly remain by far the largest export region in the foreseeable future with 25mb/d export in 2040, sharing 52 percent of the world total.

Table 1-1. Crude Oil Import Outlook (2014–2040)

	Thousand b/d			
	2014	2020	2030	2040
China	6,186	8,519	11,040	12,200
Japan	3,237	3,183	2,991	2,620
Taiwan	822	834	836	834
Korea	2,469	2,481	2,483	2,408
ASEAN	1,987	3,920	5,026	6,525
South Asia	3,900	5,880	8,494	8,911
Oceania	566	556	516	360
Asia Pacific total	19,167	25,373	31,386	33,858
US	7,388	6,628	6,422	5,300
Canada	564	161	80	40
Latin America	925	988	1,090	1,106
Americas total	8,877	7,777	7,592	6,446
Europe	10,307	8,228	6,792	6,250
FSU	584	210	106	negligible
Africa	656	701	773	796
Middle East	492	526	580	588
Total	40,083	42,813	47,228	47,938

ASEAN = Association of Southeast Asian Nations; FSU = Former Soviet Union; US = United States.

Source: IEEJ.

Table 1-2. Crude Oil Export Outlook, by Region (2014–2040)

	Thousand b/d			
	2014	2020	2030	2040
ASEAN	848	441	230	120
Australia	161	302	420	472
Other Asia Pacific	212	198	175	112
Asia Pacific total	1,221	942	825	704
US	345	209	424	591
Canada	2,266	2,844	3,452	3,707
Latin America	5,001	4,166	3,889	3,509
Americas total	7,612	7,219	7,764	7,807
Europe	1,885	158	negligible	negligible
FSU	6,798	6,876	7,254	7,847
Africa	5,774	5,832	6,390	6,454
Middle East	16,793	21,786	24,995	25,127
Total	40,083	42,813	47,228	47,938

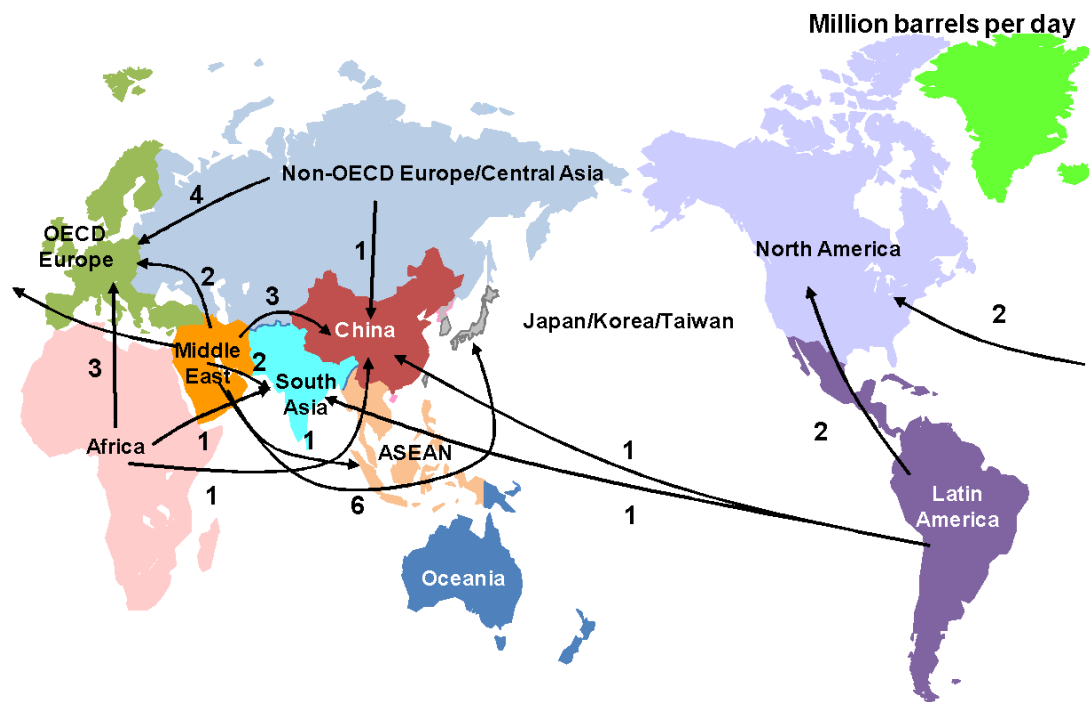
ASEAN = Association of Southeast Asian Nations; FSU = Former Soviet Union; US = United States.

Source: IEEJ.

1.1.2. Trade flow and shipping frequency through major choke points

Being by far the largest export region, the Middle East is currently the origin of the major crude oil flow (Figure 1-3). It exported 12 mb/d to Asia, 2 mb/d to Europe, and 2 mb/d to North America in 2014. This is followed by the flows from non-Organisation for Economic Co-operation and Development (OECD) Europe/Central Asia, mostly Russia to Europe (4mb/d), Africa to Europe (3mb/d), and Latin America to North America (2mb/d).

Figure 1-3. Major Interregional Oil Flows (2014)



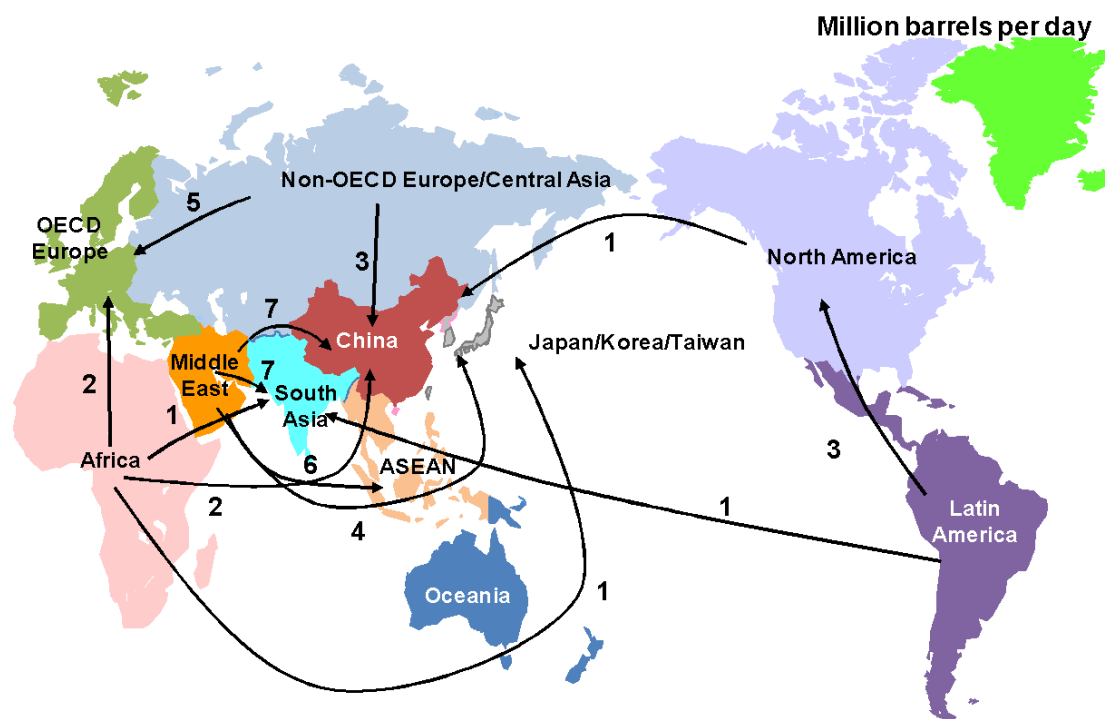
ASEAN = Association of Southeast Asian Nations; OECD = Organisation for Economic Co-operation and Development.
Source: IEEJ.

There is no doubt that, among various choke points in the world, the Hormuz and Malacca/Singapore Straits will be the two most important passages for oil trade for Asia. In the last several years in the 2010s, dependence on Middle Eastern crude oil has eased because of a larger volume of crude imports from non-Middle Eastern sources such as Russia, Africa, and Latin America. Figure 1-4 represents the growing oil demand in Asia that will be largely met by the Middle East because of its development cost competitiveness and geographical proximity, although the growth rate will slow down after 2030 due to demand growth in the Middle East. This means the dependence on the two important choke points will inevitably increase.

It should be noted that this oil flow outlook only concerns crude oil rather than oil products. Should oil products and liquefied petroleum gas (LPG) be included, the total oil flow (i.e.

crude, oil products, LPG) will be even more substantial in the future, especially in the Hormuz and Malacca/Singapore Straits.

Figure 1-4. Major Interregional Crude Oil Flows (2040)



ASEAN = Association of Southeast Asian Nations; OECD = Organisation for Economic Co-operation and Development.
Source: IEEJ.

Table 1-3 represents the outlook of crude oil shipping through major choke points for the East Asia Summit (EAS) region. While those choke points will be busier towards 2040, the question is whether they will be able to handle increasing traffic. Physical limitation of shipping passage does not seem to be an issue for the Hormuz Strait that is deep and wide enough, also for the Panama Canal and Bering Strait that a limited number of oil tankers are expected to go through. For the Malacca/Singapore Straits, on the other hand, physical limitation might be the case in the future, although there are conflicting views among maritime experts as to whether Malacca/Singapore will overflow with vessels. There are no clear criteria as to how many vessels (or tonnage) can pass through the straits. Even if the straits can manage an increasing number of vessels, considering the possibility of accidents and oil spills, it is sensible to develop alternative routes such as Sunda and Lombok in

Indonesia. Diverting a cargo ship from Malacca/Singapore straits to Sunda and Lombok will add 36 and 72 hours, or \$48,000–\$72,000 of transportation cost, respectively¹.

Table 1-3. Outlook of Crude Oil Shipping through Major Choke Points for EAS Region

Choke point		2014		2030		2040	
		Thousand b/d	number of tanker passages	Thousand b/d	number of tanker passages	Thousand b/d	number of tanker passages
Hormuz	Asia bound	12,419	7,815	23,414	14,735	23,994	15,100
	Atlantic bound	4,443	2,796	1,573	990	negligible	negligible
	Total	16,862	10,611	24,987	15,725	23,994	15,100
Malacca/Singapore		12,272	7,723	18,456	11,615	19,404	12,211
Panama*		91	133	127	93 (47)	140	103 (51)
Bering		0	0	negligible	negligible	negligible	negligible

Notes: 1. Average tanker size for Hormuz and Malacca/Singapore is assumed at 1.1 million barrels (mb) (based on the research by the Nippon Foundation and the Institution for Transport Policy Studies. For the Panama Canal, it is assumed that Panamax (0.5mb) and Suezmax (1mb, indicated in brackets in the table) will be utilised.

2. Number of tanker passages assumes round trips.

EAS = East Asia Summit.

Source: IEEJ.

1.2. Liquefied Natural Gas

1.2.1. Trade

LNG imports grew by 5.6 percent per annum from 118 million tonnes (MT) from 2000 to 239 MT in 2014. Asia, mainly Japan, Korea, China, Taiwan, and India, is the largest importing region, that is followed by Europe and Americas. In 2014, 29 countries, including 8 EAS countries, imported LNG² (Figure 1-5).

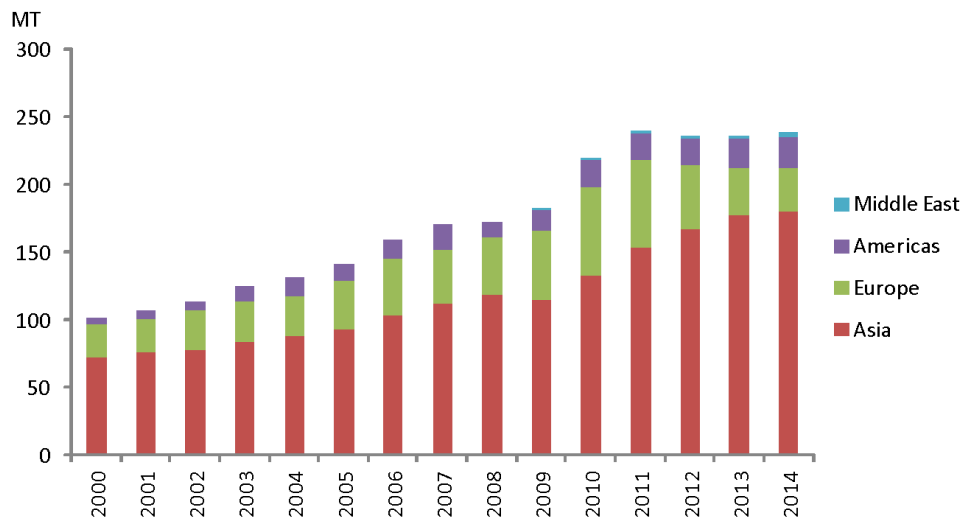
The largest export region of LNG is the Middle East (Qatar, United Arab Emirates, Oman, and Yemen), which exported 96 MT in 2014. That is followed by Asia, Africa, and Oceania. Nineteen countries, including six EAS countries³, exported LNG in 2014 (Figure 1-6).

¹ Very large crude carrier (VLCC) shipping from the Persian Gulf to Northeast Asia and charter rate of \$24,000/day are assumed here.

² China, India, Japan, Korea, Malaysia, Singapore, Thailand, and the US.

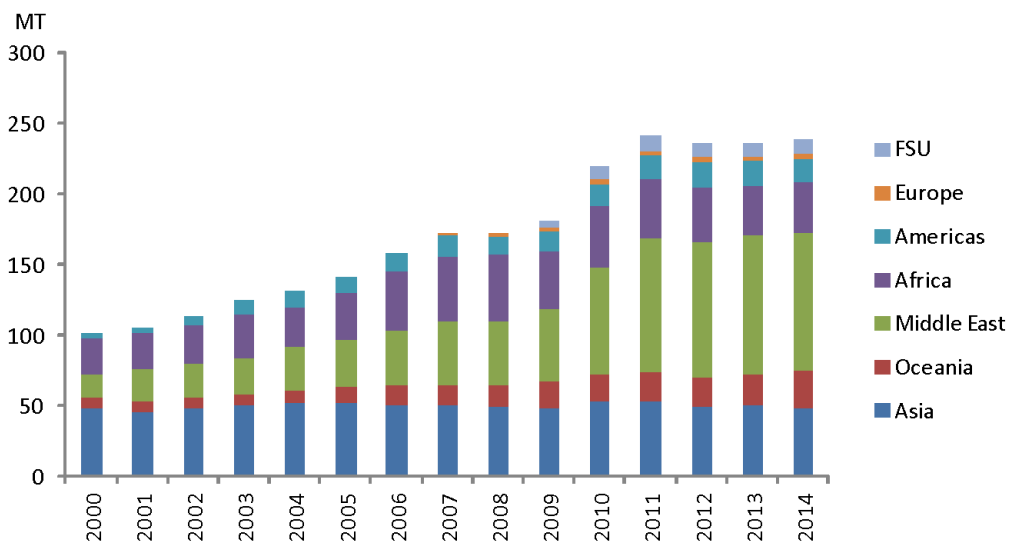
³ Australia, Brunei, the US, Indonesia, Malaysia, and Russia.

Figure 1-5. LNG Imports, by Region (2000–2014)



LNG = liquefied natural gas; MT = million tonne.
Source: GIIGNL (2015).

Figure 1-6. LNG Exports, by Region (2000–2014)



FSU = Former Soviet Union; LNG = liquefied natural gas; MT = million tonne.
Source: GIIGNL (2015).

Table 1-4 represents LNG import outlook towards 2040. With robust natural gas demand and inadequate supply growth, international trade of natural gas, especially in the form of LNG, is likely to increase rapidly towards 2040. According to the IEEJ, LNG demand in Asia will expand from 179 MT in 2014 to as much as 394 MT in 2040.

However, the forecast situations may vary from country to country. Japan, the largest LNG importer in the world, will greatly decrease its imports mainly due to the restart of its nuclear power plants, renewable expansion, and energy efficiency. Korea is expected to follow a similar path with its expansion of nuclear and coal-fired power generation. Despite the uncertainty in terms of the extent of energy efficiency, gas-fired power generation in the power mix, and pipeline gas imports, China will be the largest LNG importing country in the world in 2040. Compared with Northeast Asia, other regions will remain minor importers. Nevertheless, with 62 MT, India will be the third largest LNG importer in the world in 2040. LNG imports in Southeast Asian countries will quickly reach 70 MT in 2040. While Europe will import significantly more in the future, the import growth potential in Oceania, North America, and South America is limited towards 2040.

Table 1-4. LNG Import Outlook

		Million Tonnes			
Region	Country	2014	2020	2030	2040
Asia Pacific	Japan	89	75	85	86
	Korea	38	36	44	45
	China	19	47	82	99
	Thailand	1	8	19	25
	Singapore	2	8	11	14
	Malaysia	2	5	6	8
	Indonesia	0	5	9	12
	Vietnam	0	1	3	6
	Philippines	0	1	4	5
	India	15	23	50	62
	New Zealand	0	0	1	1
	Taiwan	13	15	21	23
	Pakistan	0	2	2	4
	Sri Lanka	0	0	1	1
	Bangladesh	0	0	2	2
		Sub total	179	227	339
Middle East	Persian Gulf	4	7	13	21
	Non Persian Gulf	0.1	3	4	5
	Sub total	4	10	17	26
Europe	Baltic	0.1	4	5	9
	Atlantic	13	31	32	33
	Medditeranean	19	44	46	46
	Sub total	32	78	83	88
Americas	North America	10	10	11	12
	South America	12	12	15	17
	Sub total	23	22	26	29
Africa	North Africa	0	0	2	3
	Sub Sahara Africa	0	1	5	7
	Sub total	0	1	7	10
Total		238	338	472	547

Source: IEEJ.

Table 1-5 represents the LNG export outlook towards 2040. The biggest change in terms of LNG export towards 2040 is the emergence of North America as a significant export region. Thanks to the shale revolution, the region, especially the US, is rapidly developing export capacity. Exporting the first cargo from the Gulf of Mexico in 2016, the US export will reach as much as 95 MT in 2040. Oceania, mainly Australia, is expanding capacity too. Together with Papua New Guinea, the region will export as much as the US in 2040. The Middle East, on the other hand, will export less in 2020 mainly due to feed gas shortage as well as losing market share. However, the LNG demand growth will call for Middle East supplies in 2030 onwards, and the Middle East will pick up its export quickly.

Table 1-5. LNG Export Outlook

	Million Tonnes			
	2014	2020	2030	2040
ASEAN	48	45	43	39
Oceania	27	67	85	98
US	0.3	31	66	95
Canada	0	0	24	32
S&C America	17	14	13	11
Americas total	17	45	103	138
Europe	4	3	2	1
FSU	11	15	31	55
Africa	36	45	56	87
Middle East	96	89	109	129
Total	239	309	429	547

ASEAN = Association of Southeast Asian Nations; FSU = Former Soviet Union; S&C America = South and Central America; US = United States.

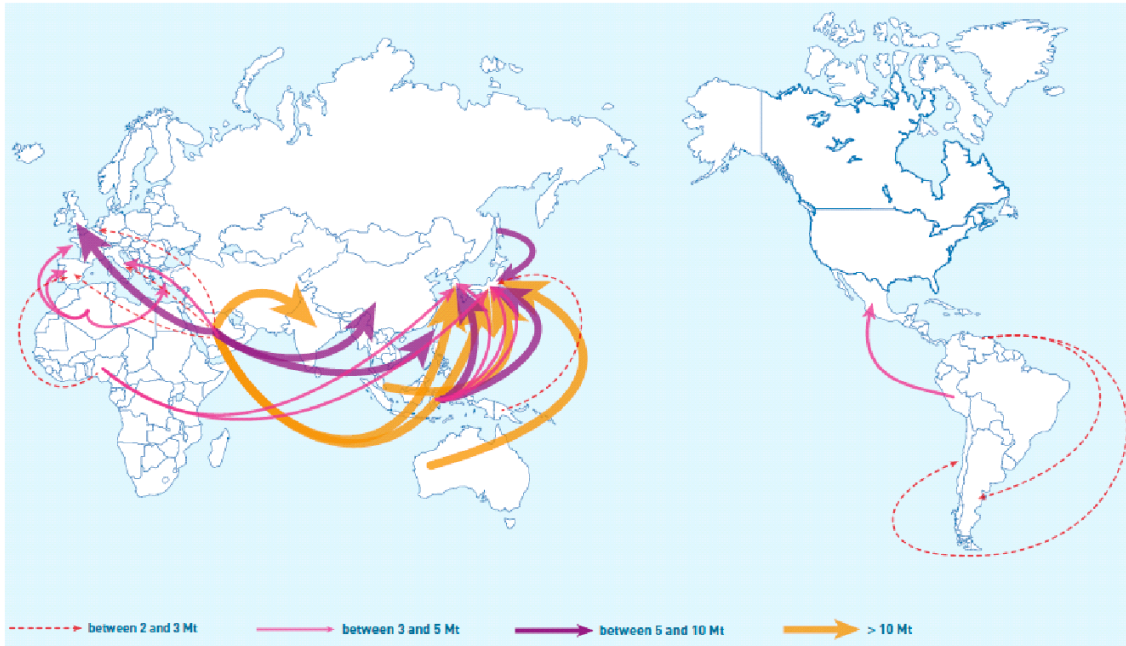
Source: IEEJ.

1.2.2. Trade flow and shipping frequency through major choke points

Figure 1-7 indicates major LNG flows in 2014. Flows are from the Middle East to Asia (74 MT), Southeast Asia to Northeast Asia (48 MT), Oceania to Asia (27 MT), the Middle East to Europe (18 MT), and Africa to Europe (15 MT). With excessive supply to Europe, 6MT was reloaded at European LNG terminals and re-exported to Asia and Latin America.

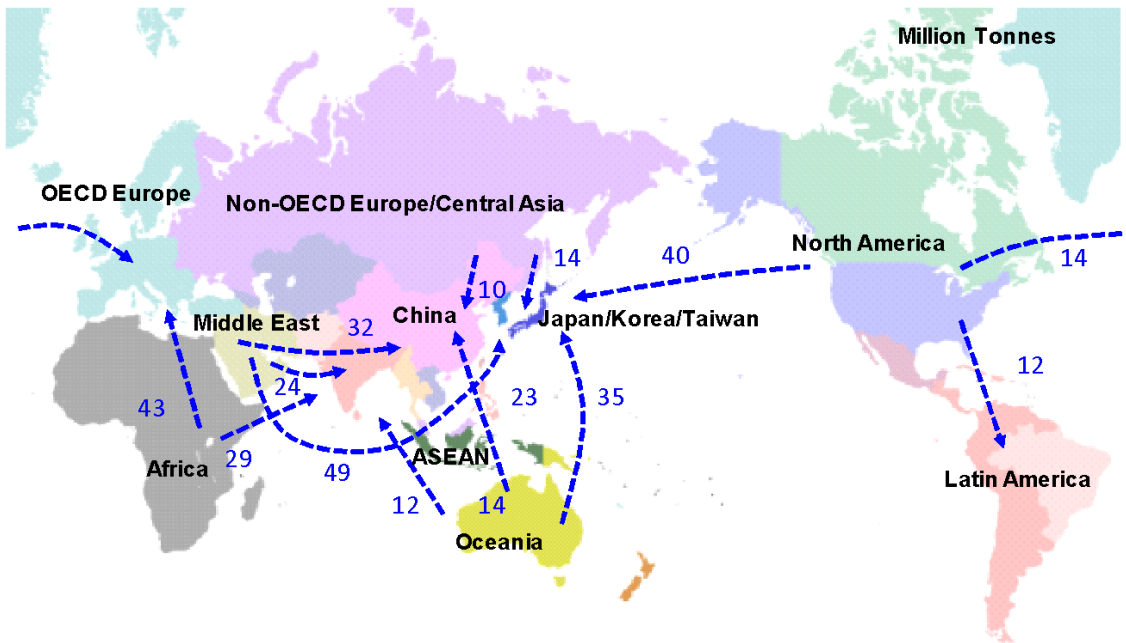
Figure 1-8 outlooks major LNG flows in 2040. Major choke points like Hormuz and Malacca/Singapore straits will remain important especially for Asian countries, although LNG flows will be more diversified. Panama and Bering will emerge as new choke points since the US will be the third largest LNG exporter by 2020 and the giant Yamal LNG in Arctic will start operation by 2020. For Atlantic market, Hormuz, Bab al-Mandab, and Suez will remain critical especially for the cargoes from Middle East. With commercialisation of East African LNG in Mozambique and possibly Tanzania and regasification terminals in Sub Sahara Africa might make Cape of Good Hope and Mozambique Channel significant choke points, too.

Figure 1-7. Major LNG Flows (2014)



Source: GIIGNL (2015).

Figure 1-8. Major LNG Flows (2040)



ASEAN = Association of Southeast Asian Nations; LNG = liquefied natural gas; OECD = Organisation for Economic Co-operation and Development.

Source: IEEJ.

Taking future flow changes into account, the Hormuz Strait, Malacca/Singapore Straits, the Panama Canal, and the Bering Strait are the most important choke points for LNG supplies to Asian countries.

Table 1-6 represents the outlook of LNG shipping through major choke points for the EAS region. With robust demand growth, major choke points will clearly be busier with more LNG tankers. Hormuz and Malacca/Singapore Straits will remain the busiest of all. With existing exporters, Qatar and the United Arab Emirates, it is assumed that Iran will start exporting LNG in the 2020s. Panama and Bering traffic will pick up quickly, but not to the extent of the Hormuz and Malacca/Singapore Straits. The latter will not only accommodate east bound tankers mainly from the Middle East and Africa to meet the demand mainly in Northeast Asia but also some west bound tankers mainly from Australia to Malaysian and Singaporean regasification terminals.

Therefore, as mentioned in Section 1.2, diverting away from Malacca/Singapore could be a reality in the future. Should that be the case, there would be additional shipping hours and the cost would be \$56,000–\$84,000⁴.

Table 1-6. Outlook of LNG Shipping through Major Choke Points for the EAS Region

Choke point		2014		2030		2040	
		MT	number of tanker passages	MT	number of tanker passages	MT	number of tanker passages
Hormuz	Asia bound	61	1,537	62	1,580	72	1,820
	Atlantic bound	20	503	24	608	28	700
	Total	81	2,040	96	2,431	111	2,801
Malacca/ Singapore	East bound	94	2,388	67	1,693	102	2,589
	West bound	0.5	13	9	215	11	278
	Total	95	2,401	75	1,908	113	2,867
Panama		0	0	18	450	63	1,597
Bering		0	0	3	76	10	242

Note: 1. Tanker size is assumed to be 170,000 cubic meter (79,000 tonnes)

2. Number of tanker passages assumes round trips.

Source: IEEJ.

⁴ Tanker rate of \$28,000 is assumed here.