Chapter 6

Investment in LNG Supply Chain Infrastructure Estimation

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Chapter 6
Investment in LNG supply chain infrastructure estimation

6.1 Introduction

This chapter presents the investment estimates for developing additional LNG supply chain infrastructures. These estimates are based on the unit investment costs of Japanese companies in the case studies. The main outputs are total estimated investments for LNG supply chain infrastructures by country and by infrastructure type.

6.2 Methodology

6.2.1 Unit investment costs of LNG infrastructures and facilities

The scope of the estimation is as follows:

- ✓ Primary and secondary LNG terminal construction cost (not included in port development);
- ✓ Maximum 32.5 km natural gas transmission pipeline construction cost from the nearest port;
- ✓ ISO containers for railway freight services and truck transports; and
- ✓ LNG satellite storage facilities.

The following are not included in the estimation:

- ✓ Land acquisition costs;
- ✓ Secondary transport for SSLNG tankers;
- ✓ Investment for port development like water channels, water brakes, and so on;
- ✓ Natural gas transmission and distribution pipelines that are more than 32.5 km from the nearest port;
- ✓ Rail tracks and the like, and road and bridge enhancements or enforcement costs;
- ✓ Trailer heads; and
- ✓ Financial costs like interests.

The unit costs of investment estimation were taken from Japanese cases. Unit costs were collected for the primary LNG-receiving terminal, secondary terminal, satellite, and the like.

Table 20. Scope of the Cost Component

Value Chain	LNG Carrier	LNG-Receiving Terminals	Satellite	Pipeline	Lorry	Train Container
Component	Ocean tanker	Primary (onshore)	Satellite	Pipeline	Lorry	Train Container
	Coastal tanker	Primary (FSRU)	-	-	-	-
	-	Secondary (onshore)	-	-	-	-

FSRU = floating storage and regasification units, LNG = liquefied natural gas.
Source: Authors.

The investment cost for SSLNG carriers is higher per tonne compared to the cost for large-scale LNG vessels. The primary LNG terminal of Sendai City Gas in Japan has a capacity of 80 thousand kilolitre (kl) and its size is close to the usual secondary terminals in Japan. An ocean tanker of 18,800 m^3 (approximately 8,200 tonnes) serves the terminal and makes a maximum of 20 x approximately 5,200 km trips annually between Malaysia and Japan. This tanker is in the smallest category in Table 21. LNG ocean tankers used by Japanese utility companies are usually in the range of 60,000–90,000 tonnes.

Thus, the unit cost for an ocean tanker serving a large primary terminal is US$6,000/$m^3$, while the cost for a coastal tanker serving a secondary terminal is US$15,000/$m^3$. The unit cost is much higher for a small tanker.

Table 21. Typical Investment Cost for LNG Carriers, Crew, and Harbour Cost (Shell Historic STS database)

Size (m^3)	CAPEX (US$ million)	CAPEX (US$ Thousand/ m^3)	Typical crew number	Typical harbour cost (Europe)
215,000	250	6.0	30–35	US$100-200K /visit
135,000	170	6.5	25–35	US$75-150K /visit
28,000	80	15.0	15–20	US$25-40 K /visit

K = thousand, LNG = liquefied natural gas, m^3 = cubic metre.
Source: Adapted from International Gas Union (2015).

An onshore LNG terminal could cost up to JPY100 billion, while FSRUs cost up to JPY30 billion for a new build and JPY8 billion for a remodelled used ship. Primary and secondary terminals are structurally the same, and the size is different.

Table 22. Comparison of Onshore LNG Terminal and FSU/FSRU

	Onshore LNG Terminal	FSU/FSRU
Capex	>= US$100 billion	>= US$30 billion (New build; almost equal to a new build LNG ship) >= US$8 billion (LNG ship remodelled)
EPC Period	5–7+ years (EPC, Environment Assessment and Approval)	3 years (new build) 1 year (LNG ship remodelled)
Environmental Impacts and Regulations	Large environmental impacts Stringent regulations	Small environmental impacts Little regulations
Atmospheric and Marine Phenomena	N.A.	Calm atmospheric and marine conditions are required (Impacts of waves are large)
Removal	Permanent usage is considered	Moving and removal are easy (Temporary use is possible)
Expansion	Flexible	Incremental by adding ships

EPC = engineering, procurement, and construction, FSRU = floating storage and regasification units, FSU = floating storage units, LNG = liquefied natural gas, N.A. = not applicable.
Source: Japan Oil, Gas and Metals National Corporation (JOGMEC) (2013)

An engineering company and a pipeline manufacturer were interviewed to see the cost of each component in the LNG network infrastructure. The engineering company interviewed had a prototype estimate for a primary terminal and a gas-fired power plant package. The cost of each component in the package is in Table 23

Table 23. Typical Cost of a Primary Terminal and Gas-Fired Power Plant Package

Facilities	Capacity	Unit Cost	Consideration
LNG-receiving terminals	5 MTPA/ terminal	US$50 billion ± US$10 billion for a 5.0 MTPA terminal	Gasification facilities + tank (180,000 m^3) Cost varies depending on the ground conditions, the degree of earthquake preparedness, and availability of LNG piers
LNG satellite	200 kl/satellite	US$2 billion	
Loading facility		US$5 billion	
LNG tankers		US$20 billion /ship	Three to four tankers are needed for an LNG-receiving terminal with 5.0 MTPA
Trucks, lorries		US$0.1 billion /vehicle (conforms to	Approximately 10 vehicles are needed for an LNG-receiving terminal with 5 MTPA

Facilities	Capacity	Unit Cost	Consideration
		Japanese standards) A Chinese vehicle would cost a third of this figure	
Gas turbine generator	50 MW × 2	US$15–20 billion	A 5 MTPA terminal can supply 10 power plants with 100 MW.
Pipeline	Costs for pipeline is minimal, however the cost for land expropriation is approximately US$.3 billion/km		

kl = kilolitre, km = kilometre, LNG = liquefied natural gas, MPTA = million tonnes per annum, MW = megawatt.
Source: Interview with an engineering company.

Figure 17 shows the investments and capacity of primary LNG terminals in Japan. When considering the capacity of LNG terminals and construction types (underground or on the ground), the estimated unit investment for the construction of an LNG terminal is JPY450 million/1,000 tonnes of LNG. This number will be applied for the estimation of primary and secondary LNG terminals in the following subsection.

Figure 17: Estimation of Unit Investment on LNG Terminal Construction in Japan

Owner	Name of terminal	Total investment （approximate：100million JPY）	Capacity of facility（kl）	Area（m²）	LNG vaporizer(t/h)	Type of construction（underground=1)
Hokkaido Gas	Ishikari	400	180,000	96,902	200	0
City gas of Sendai	Sendai	369	80,000	96,459	90	1
Tokyo Electric	Futtsu	1,145	360,000	210,000	570	1
Tokyo Gas	Ogishima	1,700	200,000	312,000	300	1
Impex	Naoetsu	1,000	360,000	250,000	370	1
Shimizu LNG	Sodeshi	500	177,200	89,000	110	0
Chita LNG	Chita LNG	915	480,000	319,540	650	0
Toho gas	Yokkaichi	290	80,000	86,959	40	0
Chubu Electric	Yokkaichi LNG	780	320,000	141,000	560	0
Osaka gas	Himeji	700	320,000	465,000	120	0
Kansai Electric	Himeji LNG	625	280,000	190,000	600	0
Hiroshima Gas	Hatsuka ichi	240	85000	34808	42	0
Chugoku Electric	Yanai LNG	660	240000	500000	110	0
Saibu Gas	Fukukita LNG	230	35000	64000	40	1
Oita LNG	Oita LNG	820	240000	296000	380	0
Nihon Gas	Kagoshima LNG	130	36000	67000	15	0

Dependent variables

Explanatory variables

	Coefficients	Standard errors	t	P-value
Intercept	91.219	145.891	0.625	0.543
Capacity of facility（kkl）	2.07390	0.541	3.834	0.002
Type of construction（underground=1)	368.283	148.885	2.474	0.028

Regression statistics	
R	0.777
R2	0.604
Adjusted R2	0.544
Standard errors	276
Observation	16

Y=2.0739(100 million JPY/kkl)*Capacity(kkl)＋91.219(100 million JPY)
Y=2.0739(100 million JPY/1000m³)*Capacity(1000m³)＋91.219(100 million JPY)
Y=4.508486(100 million JPY/1000 ton)*Capacity(1000 ton)＋ 91.219(100 million JPY)

kl = kilolitre, kkl = please supply, LNG = liquefied natural gas, m^2 = square metre, m^3 = cubic metre, t/h = ton per hour..
Source: authors.

The cost of developing a pipeline varies considerably, depending on the country. The cost has a strong regional character as the pipeline development task is very labour intensive. Half of the cost is allocated to civil engineering and the share of labour cost is large. The price of the pipeline itself does not vary much among countries. The cost of eminent domain of right-of-way for pipeline deployment is also high. The state and municipalities often carry out the land clearance task, though sometimes contractors must do it at their own cost. If the project is backed by official development assistance, municipalities are responsible for the land clearance.

Table 24. Unit Investment on Natural Gas Transmission Pipeline in Japan

Name of line	Owner	Completion year	Diameter	Investment (JPY million)	Length （m）	Unit investment/m （JPY1,000/m）
Tochigi Line	Tokyo Gas	2005	400A	16,800	69,400	**242**
Fukushima Line	JAPEX	2007	400A	20,000	95,000	**211**
Gunma Trunk Line	Tokyo Gas	2009	500A	5,700	15,700	**363**
Chiba Kashima	Tokyo Gas	2010	600A	25,700	73,100	**352**
New Negishi Trunk	Tokyo Gas	2013	600A	15,500	14,100	**1,099**
Yokohama Trunk ph2	Tokyo Gas	2013	750A	7,700	6,300	**1,222**
Central Trunk	Tokyo Gas	2010	600A	4,500	10,400	**433**
New Oumi	IMPEX	2009	500A	9,500	49,000	**194**
S-H Line	Shizuoka Gas	2013	400A 500A	35,000	113,000	**310**
Himeji Okayama	Osaka Gas	2014	600A	30,000	85,000	**353**
Mie Shiga Line	Chubu Electric and Osaka Gas	2011	600A	20,000	60,000	**333**
Circle Trunk Line	Toho Gas	2009	600A	52,000	117,000	**444**
West Circle Line	Toho Gas	2009	600A	6,000	14,000	**429**

m = metre, NG = natural gas.
Source: http://www.meti.go.jp/meti_lib/report/H28FY/000610.pdf.

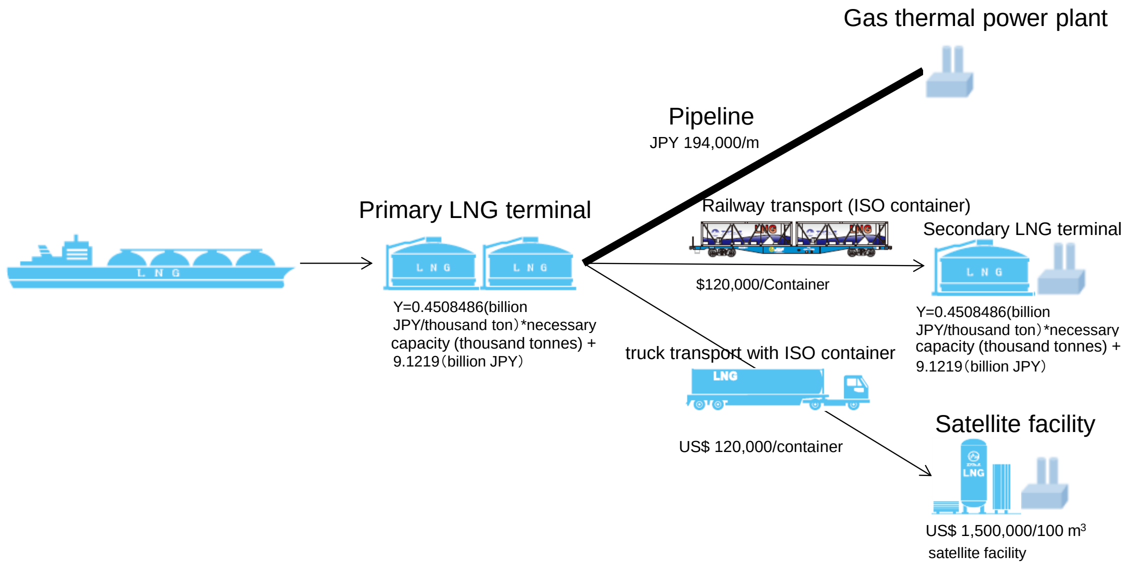
Table 24 shows the cases of natural gas transmission pipeline construction. The range of unit investment per metre is from JPY194–JPY1,222 thousand. When considering the difference in labour costs between ASEAN, India, and Japan, the higher unit investment will lead to over estimation. Therefore, the minimum unit investment of JPY194,000/m can be regarded as the unit investment for the following estimation.

PTT of Thailand conducted a pre-feasibility study on lorry LNG delivery system serving a mountainous remote area. In the study, the loading system at a terminal costs a couple of hundred million yen, and the lorry and off-loading facility costs another a couple of hundred million yen.

The unit investment of satellite facility development was confirmed through interviews of Japanese engineering or manufacturing companies. The unit investment per 100 m^2 capacity satellite facility is JPY1.5 million. The unit price of a 40-feet ISO container is US$120, 000.

Figure 18 shows the summary of unit investment on LNG supply chain infrastructure development.

Figure 18: Summary of Unit Investment on LNG Supply Chain Infrastructure Development



ISO = International Standard Organization, JPY = Japanese Yen, LNG = liquefied natural gas, m = metre, m^3 = cubic metre,

6.2.2 Estimation methods

When estimating investment amount for LNG supply chain infrastructure development, the facility capacity of LNG terminals and satellite facilities is decided through dividing the total LNG demands (MTPA) by 52 weeks. This means that each storage facility can have 1 week LNG volume as a buffer.

Next, the formula of 'capacity' multiplied by the unit of investment for construction was used for the estimation. Formulas (1), (2), (3), and (4) were applied for each demand point and ports (LNG terminals).

LNG terminal construction investment
= LNG terminal capacity (1,000 tonnes)× JPY450 million/1,000 tonnes of LNG *(1)*

Transmission pipeline construction investment
= Length of transmission pipeline (m) × JPY194,000/m *(2)*

Satellite facility construction investment
= Satellite facility capacity (m^2)/ 100× 1,500,000 JPY/100m^2 *(3)*

40ft ISO container procurement investment
= Number of necessary 40-ft ISO container× US$120,000/unit *(4)*

6.3 Results

Table 25 to Table 26 show the results of the investment estimation.

About US$31.9 billion for primary LNG terminals and about US$8.8 billion for secondary LNG terminals were estimated in total.

Table 25. Estimated Investment for Primary Terminal until 2030

Name of Primary LNG Terminal	Country	MTPA (Integrated)	Investment (US$ billion)
Cat Lai	Viet Nam	232	1.03
Hai Phong	Viet Nam	121	0.58
Ennur	India	79	0.40
Vishakhapatnam	India	9	0.12
Haldia Port	India	376	1.62
Paradip	India	295	1.29
Dahej	India	743	3.13
Mandvi	India	520	2.21
Ratnagiri	India	11	0.13
Kochi (Cochin)	India	34	0.22
Jawaharlal Nehru Port (Nhava Shiva)	India	719	3.03
Kakinada Bay	India	229	1.02
Mumbai (Bombay)	India	204	0.92
Pasir Gudang	Malaysia	55	0.31
Butterworth	Malaysia	158	0.73
Jurong Island	Singapore	641	2.71
Rangoon	Myanmar	43	0.26
Celukan Bawang	Indonesia	45	0.27
Semarang	Indonesia	139	0.65
Jakarta	Indonesia	552	2.35
Ujung Pandang	Indonesia	30	0.20
Da Nang	Viet Nam	66	0.35
Vinh Cam Ranh	Viet Nam	104	0.51
Bintulu Port	Malaysia	101	0.50
Map Ta Phut	Thailand	425	1.82
Bandar Seri Begawan	Brunei	63	0.34
Lhokseumawe	Indonesia	6	0.11
Banten	Indonesia	98	0.48
Cilacap	Indonesia	55	0.31
Bontang Lng Terminal	Indonesia	47	0.28
Muntok	Indonesia	87	0.44
Batangas City	Philippines	84	0.43
Hazira	India	143	0.67
Melaka	Malaysia	10	0.12
Cirebon	Indonesia	351	1.52
Probolinggo	Indonesia	113	0.55
Sibolga	Indonesia	53	0.30

LNG= liquefied natural gas, MTPA = million tonnes per annum.

Source: authors.

Table 26. Estimated Investment for Secondary Terminals until 2030

Name of secondary LNG terminal	Country	MTPA (Integrated)	Investment (US$ billion)
Nghe Tinh	Viet Nam	7	0.11
Machilipatnam	India	61	0.33
Chittagong	Myanmar	75	0.39
Bhavnagar	India	12	0.13
Magdalla	India	143	0.67
Navlakhi	India	516	2.20
New Mangalore	India	6	0.11
Belekeri	India	10	0.12
Nagappattinam	India	4	0.10
Cuddalore	India	28	0.20
Tuticorin	India	11	0.13
Kuantan New Port	Malaysia	9	0.12
Port Klang	Malaysia	58	0.32
Kirteh Oil Terminal	Malaysia	11	0.13
Bangkok	Thailand	190	0.86
Khanom	Thailand	23	0.18
Moulmein Harbor	Myanmar	12	0.13
Gresik	Indonesia	40	0.25
Belawan	Indonesia	26	0.19
Teluk Bayur	Indonesia	13	0.13
Nasugbu	Philippines	16	0.15
Manila	Philippines	28	0.20
Qui Nhon	Viet Nam	16	0.15
Phu My	Viet Nam	11	0.13
Duong Dong	Viet Nam	40	0.25
Karaikal Port	India	33	0.22
Pelabuhan Sungai Udang	Malaysia	92	0.46
Port Dickson	Malaysia	11	0.13
Teluk Anson	Malaysia	8	0.12
Sapangar Bay	Malaysia	17	0.15
Kuala Trengganu	Malaysia	144	0.67
Pelabuhan Bass	Malaysia	36	0.23
Si Racha Terminal	Thailand	28	0.20
Petchburi Terminal	Thailand	67	0.36
Sittwe	Myanmar	4	0.10
Dumai	Indonesia	23	0.18
Davao	Philippines	4	0.10
Tanjung Leman	Malaysia	10	0.12

Name of secondary LNG terminal	Country	MTPA (Integrated)	Investment (US$ billion)
Tanjung Tokong	Malaysia	6	0.11
Pelabuhan Sandakan	Malaysia	27	0.19
Rayong Tpi Terminal	Thailand	23	0.18
Songkhla Harbor	Thailand	6	0.11
Keppel (East Singapore)	Singapore	274	1.21
Anyer Lor	Indonesia	44	0.26
Stagen	Indonesia	5	0.10
Kijang	Indonesia	9	0.12
Panjang	Indonesia	12	0.13
Parepare	Indonesia	15	0.14

LNG= liquefied natural gas, MTPA = million tonnes per annum.
Source: Authors.

The estimate for a natural gas pipeline from an LNG terminal to a new gas thermal power plant is US$2.56 billion.

Table 27. Estimated Investment for Pipelines of New Gas Thermal Power Plants until 2030

Plant name	LNG (MTPA)	Country	Port name	Distance to nearest port (km)	Investment (US$ billion)
Nhon Hoi Refinery	0.819	Viet Nam	Nhon Hoi Refinery	9	0.016
Phu My	0.151	Viet Nam	Phu My	9	0.017
Thoi Hoa	1.170	Viet Nam	Thoi Hoa	61	0.107
Nhon Trach	1.078	Viet Nam	Nhon Trach	19	0.034
Hiep Phuoc	0.890	Viet Nam	Hiep Phuoc	22	0.038
Ca Mau City	1.924	Viet Nam	Ca Mau City	176	0.310
Prodair Kochi	0.300	India	Prodair Kochi	17	0.030
Pillaiperumalnallur	1.613	India	Pillaiperumalnallur	27	0.048
Mangalore Refinery	0.291	India	Mangalore Refinery	9	0.015
Rajahmundry	3.279	India	Rajahmundry	54	0.096
Trombay	4.935	India	Trombay	5	0.010
Sugen	5.946	India	Sugen	34	0.061
Palatana	1.557	India	Palatana	142	0.250
Sultan Iskandar	2.684	Malaysia	Sultan Iskandar	2	0.004
Bintulu	2.017	Malaysia	Bintulu	11	0.020
Kulim Indust Park	1.240	Malaysia	Kulim Indust Park	23	0.041
Kimanis Power	0.867	Malaysia	Kimanis Power	55	0.097
Khanom	0.530	Thailand	Khanom	4	0.008
Glow Spp Phase 3-5	0.599	Thailand	Glow Spp Phase 3-5	3	0.006

Plant name	LNG (MTPA)	Country	Port name	Distance to nearest port (km)	Investment (US$ billion)
Sriracha Ipt	0.169	Thailand	Sriracha Ipt	8	0.014
Ratchaburi	1.502	Thailand	Ratchaburi	71	0.126
South Bangkok	0.320	Thailand	South Bangkok	12	0.021
North Bangkok	0.466	Thailand	North Bangkok	34	0.060
Korat	0.547	Thailand	Korat	228	0.402
Nong Chok	0.538	Thailand	Nong Chok	290	0.511
Jurong Island	9.373	Singapore	Jurong Island	6	0.011
Gadong	0.407	Brunei	Gadong	11	0.019
Pemaron	0.590	Indonesia	Pemaron	26	0.046
Cilegon Nsi	0.940	Indonesia	Cilegon Nsi	5	0.009
Cilacap	1.425	Indonesia	Cilacap	5	0.010
Petorkima Gresik	1.985	Indonesia	Petorkima Gresik	2	0.003
Bontang Works	0.783	Indonesia	Bontang Works	1	0.002
Paya Pasir	1.312	Indonesia	Paya Pasir	8	0.014
North Duri	1.183	Indonesia	North Duri	2	0.003
Muara Tawar	3.969	Indonesia	Muara Tawar	13	0.024
Calaca Semirara	0.569	Philippines	Calaca Semirara	25	0.043
Santa Rita Batangas	0.580	Philippines	Santa Rita Batangas	1	0.002
Therma South	0.165	Philippines	Therma South	19	0.033

LNG= liquefied natural gas, MTPA = million tonnes per annum.
Source: Authors.

The estimate for the development of a natural gas pipeline from an LNG terminal to a converted gas thermal power plant is US$406 million.

Table 28. Estimated Investment for Pipelines of Converted Gas Thermal Power Plants until 2030

Plant	LNG (MTPA)	Country	Port name, C,254	Distance to nearest port (km)	Investment (US$ billion)
Hai Phong Thermal-I	0.025	Viet Nam	Nghe Tinh	12	0.021
Vizag Refinery	0.004	India	Vishakhapatnam	2	0.004
Kribhco Hazira	0.021	India	Magdalla	11	0.019
Sikka	0.085	India	Sikka	3	0.005
Kochi Refinery	0.002	India	Kochi (Cochin)	11	0.020
Mahul Refinery	0.004	India	Mumbai (Bombay)	6	0.010
Mumbai Hll	0.002	India	Mumbai (Bombay)	6	0.010

Plant	LNG (MTPA)	Country	Port name, C,254	Distance to nearest port (km)	Investment (US$ billion)
Thane Plant	0.003	India	Jawaharlal Nehru Port (Nhava Shiva)	28	0.049
Paradip Works	0.023	India	Paradip	6	0.010
Madras Southern Petro	0.013	India	Chennai (Madras)	3	0.005
Manali Refinery	0.004	India	Chennai (Madras)	8	0.014
Durgapur Plant Hfcl	0.025	India	Haldia Port	6	0.010
Patau-Patau	0.023	Malaysia	Labuan	1	0.001
Kuantan	0.012	Malaysia	Kuantan New Port	22	0.038
Perai	0.006	Malaysia	Butterworth	2	0.004
Khanom	0.051	Thailand	Khanom	4	0.008
Jurong	0.060	Singapore	Jurong Island	6	0.011
Pulau Seraya	0.010	Singapore	Jurong Island	1	0.002
Mawlamyaing	0.008	Myanmaer	Moulmein Harbor	1	0.003
Ywama	0.008	Myanmaer	Rangoon	2	0.004
Tambak Lorok	0.029	Indonesia	Semarang	3	0.005
Gresik	0.080	Indonesia	Gresik	2	0.003
Petak	0.026	Indonesia	Surabaya	1	0.002
Perak	0.011	Indonesia	Surabaya	1	0.002
Pulogadung	0.039	Indonesia	Jakarta	11	0.019
Tanjung Priok	0.015	Indonesia	Jakarta	2	0.004
Berushaan	0.007	Indonesia	Jakarta	18	0.032
Muara Karang	0.046	Indonesia	Jakarta	11	0.019
Belawan	0.030	Indonesia	Belawan	2	0.003
Batamindo Industrial	0.003	Indonesia	Sekupang	14	0.025
Tello	0.017	Indonesia	Ujung Pandang	8	0.014
Padang	0.014	Indonesia	Teluk Bayur	14	0.025
Khanom	0.051	Cambodia	Khanom	4	0.008
Total					**0.406**

LNG= liquefied natural gas, MTPA = million tonnes per annum.
C,254 = please include in notes?
Source: Authors.

About 10,253 ISO containers are needed and almost US$1.177 billion are needed.

Table 29. Estimated Investment for ISO Containers until 2030

Country	Number of ISO containers/day	Investment (US$ billion)
Cambodia	12	0.001
India	3,650	0.435
Indonesia	3,261	0.322
Malaysia	771	0.137
Myanmar	246	0.027
Philippines	471	0.052
Thailand	342	0.038
Viet Nam	1,501	0.164
Total	**10,253**	**1.177**

ISO = International Standard Organization.
Source: Authors.

The number of 100 m^3 eq. satellite tanks are estimated at 23,509 and investment amount is estimated at about US$32.06 billion (condition: 1 week amount of LNG will be stored in each satellite facility).

Table 30. Estimated Investment for Satellite Facilities until 2030

	Number of satellite facilities	Investment (US$ billion)
Brunei	63	0.086
Cambodia	25	0.034
India	8,353	11.390
Indonesia	6,817	9.296
Malaysia	2,590	3.532
Myanmar	491	0.670
Philippines	1,359	1.853
Thailand	752	1.025
Viet Nam	3,059	4.171
Total	**23,509**	**32.058**

Source: Authors.

The total additional necessary investment for LNG supply chain infrastructures in ASEAN and India, in addition to the current LNG supply chain infrastructures, is estimated at US$81.369 billion. Most investments will occur in India and Indonesia. Primary LNG terminal and satellite facilities are major investment areas.

Table 31. Estimated Investment for LNG Supply Chain Infrastructures in ASEAN and India

US$ billion	Primary terminal	Secondary terminal	Pipeline	Satellite facilities	ISO containers	Total by countries
Brunei	0.340		0.019	0.086		**0.445**
Cambodia			0.008	0.034	0.001	**0.043**
India	14.768	4.207	0.666	11.390	0.435	**31.467**
Indonesia	7.456	1.511	0.261	9.296	0.322	**18.846**
Lao PDR						**0.000**
Malaysia	1.655	2.750	0.205	3.532	0.137	**8.279**
Myanmar	0.261	0.621	0.006	0.670	0.027	**1.584**
Philippines	0.427	0.444	0.078	1.853	0.052	**2.854**
Singapore	2.712	1.208	0.025			**3.945**
Thailand	**1.824**	**1.876**	**1.155**	**1.025**	**0.038**	**5.919**
Viet Nam	**2.473**	**0.635**	**0.542**	**4.171**	**0.164**	**7.985**
ASEAN and India	**31.916**	**13.253**	**2.965**	**32.058**	**1.177**	**81.369**

ISO = International Standard Organization, LNG = liquefied natural gas.

Source: Authors.