# Chapter 4

# Current Petroleum Supply Chain in Cambodia

February 2022

**This chapter should be cited as**

ERIA Study Team (2022), 'Current Petroleum Supply Chain in Cambodia, in ERIA and General Department of Petroleum, Ministry of Mines and Energy of Cambodia (eds.), *Cambodia Petroleum Master Plan 2022-2040.* ERIA Research Project Report FY2021 No. 21, Jakarta: ERIA, pp.45-59.

# Chapter 4

# Current Petroleum Supply Chain in Cambodia

Chapter 4 clarifies the current situation of the petroleum supply chain in Cambodia. All petroleum products are imported, and most are shipped by tankers from Thailand, Singapore, and Viet Nam. However, LPG can be imported by tank-truck, so the import route is different from gasoline and diesel oil. And domestic supply is via cylinder delivery from bottling stations other than LPG service stations. In phase 2, the cost of each transportation means, the total transportation cost of each supply route, and the constraint of transportation volume of each transport means are clarified. (Please refer to Chapter 6).

The biggest import base for gasoline and diesel oil is Sihanoukville terminals by large tankers; the second is Phnom Penh terminals by small tankers via the Mekong River. Sihanoukville accounts for 60% of the total imports; the rest are from Phnom Penh and Kandal, etc. The total storage capacity is about 517,000 kilolitres (kl) nationwide, 70% in Sihanoukville. About 70,000 kl of the new expansion is planned, but about 70% is the second terminal near Phnom Penh. The second terminal receives the transfer volume from the import base.

As mentioned in Chapter 5.2, the demand for petroleum products is concentrated in Phnom Penh, Siem Reap, and Battambang. So, the Phnom Penh and Kandal terminals are the nearest import bases. However, imports to Phnom Penh and Kandal are by small tankers via the Mekong River, and because Phnom Penh and Kandal are near the city centre and expansion is difficult. On the other hand, Sihanoukville, which can import by using large tankers, is expanding as an import base. Oil companies with nationwide sales networks cannot rely only on terminals in Phnom Penh and Kandal. These oil companies have a large terminal in Sihanoukville to import using large tankers and build a second terminal near Phnom Penh for national distribution. The great distance between the demand centre and the import base is a characteristic of Cambodia's oil supply chain. Assuming that demand will more than double or triple in the future, how to prepare the supply route and transportation means will be an important issue.

## 1. Oil Terminals and Storage Capacity

### 1.1 Current situation

There are 23 oil terminals nationwide, with a total oil storage capacity of 517,047 kl (excluding jet fuel). Sihanoukville is the largest terminal area with seven oil terminals; the total storage capacity is 366,308 kl, 70.8% of nationwide capacity.

The second-largest oil terminal area is Phnom Penh, with nine oil terminals, with a total storage capacity is 77,459 kl, 15.0% of nationwide capacity. Table 4.1 shows the terminal areas nationwide. Kampot is the third-largest terminal area; it is also a maritime receiving base.

**Table 4.1 Storage Capacity of Oil Terminals, by Location (Summary)**

Unit:kl

| Location | Terminal | Gasoline | Diesel Oil | Fuel Oil | Total Capacity |
|---|---|---|---|---|---|
| Sihanoukville | 7 | 145,260 | 194,288 | 26,760 | 366,308 |
| Phnom Penh | 9 | 29,084 | 43,575 | 4,800 | 77,459 |
| Kandal | 2 | 10,000 | 4,000 | | 14,000 |
| Prey Veng | 1 | 40 | 40 | | 80 |
| Koh Kong | 1 | 1,000 | 2,000 | | 3,000 |
| Tbong Khmom | 1 | 500 | 2,000 | | 2,500 |
| Kampot | 1 | 30,200 | 14,500 | | 44,700 |
| Battambang | 1 | 7,000 | 2,000 | | 9,000 |
| **Total** | **23** | **223,084** | **262,403** | **31,560** | **517,047** |

kl = kilolitres.

Source: This project (2020).

Table 4.2 shows the storage tanks and capacity scale by terminal area, Sihanoukville, Phnom Penh, and other areas. Terminals in Sihanoukville have 49 tanks. These include 11 tanks with a capacity of 10,000 kl or more, and 19 tanks of 5,000 kl or more but less than 10,000 kl. These also include 10 tanks with 3,000 kl capacity or more but less than 5,000 kl, and nine tanks of less than 3,000 kl. These indicate many large terminals with large tanks. It also means that large tankers of 5,000–10,000 tonnes can be accepted.

On the other hand, the terminals in Phnom Penh have 40 tanks, including 14 tanks with a capacity of 3,000 kl or more but less than 5,000 kl, and 26 tanks of less than 3,000 kl. The terminal accepts a small tanker of 1,000–2,000 tonnes via the Mekong River, so a large tank is unnecessary. However, there is a reason a larger site is not possible. The other areas include Kandal and Kampot.

Kandal has two tanks with 5,000 kl; Kampot has three tanks of 5,400 kl and two tanks of 5,500 kl. Table 4.2 shows the breakdown of gasoline, diesel oil, and fuel oil.

**Table 4.2. Number of Storage Tanks and Capacity Scale (kl), by Terminal Area**

(Gasoline + Diesel Oil + Fuel Oil)

| | **Sihanoukville** | | **Phnom Penh** | | **Other Areas** | |
|---|---|---|---|---|---|---|
| **Tank Size** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** |
| Over 10,000 | 11 | 200,000 | 0 | 0 | 0 | 0 |
| 5,000-10,000 | 19 | 115,760 | 0 | 0 | 8 | 44,200 |
| 3,000–5,000 | 10 | 33,186 | 17 | 50,000 | 6 | 21,500 |
| under 3,000 | 9 | 17,362 | 23 | 27,459 | 9 | 7,580 |
| **Total** | **49** | **366,308** | **40** | **77,459** | **23** | **73,280** |

| **Gasoline** | **Sihanoukville** | | **Phnom Penh** | | **Other Areas** | |
|---|---|---|---|---|---|---|
| Tank size | Number of tanks | Total capacity | Number of tanks | Total capacity | Number of tanks | Total capacity |
| Over 10,000 | 2 | 40,000 | 0 | 0 | 0 | 0 |
| 5,000-10,000 | 11 | 71,000 | 0 | 0 | 6 | 33,200 |
| 3,000–5,000 | 6 | 20,898 | 6 | 18,000 | 4 | 14,000 |
| under 3,000 | 7 | 13,362 | 7 | 11,084 | 4 | 1,540 |
| **Total** | **26** | **145,260** | **13** | **29,084** | **14** | **48,740** |

| **Diesel Oil** | **Sihanoukville** | | **Phnom Penh** | | **Other Areas** | |
|---|---|---|---|---|---|---|
| **Tank size** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Over 10,000 | 9 | 160,000 | 0 | 0 | 0 | 0 |
| 5,000–10,000 | 3 | 18,000 | 0 | 0 | 2 | 11,000 |
| 3,000–5,000 | 4 | 12,288 | 8 | 27,200 | 2 | 7,500 |
| under 3,000 | 2 | 4,000 | 16 | 16,375 | 5 | 6,040 |
| **Total** | **18** | **194,288** | **24** | **43,575** | **9** | **24,540** |

| **Fuel Oil** | **Sihanoukville** | | **Phnom Penh** | | **Other Areas** | |
|---|---|---|---|---|---|---|
| **Tank size** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** | **Number of tanks** | **Total capacity** |
| Over 10,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5,000–10,000 | 5 | 26,760 | 0 | 0 | 0 | 0 |
| 3,000–5,000 | 0 | 0 | 3 | 4,800 | 0 | 0 |
| under 3,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **5** | **26,760** | **3** | **4,800** | **0** | **0** |

kl = kilolitres.

Source: This project.

### 1.2 Expansion plan

The total capacity of oil terminals planned in the next few years is 70,380 kl, and the total storage capacity of Cambodia will be about 590,000 kl. The two new oil terminals planned in Phnom Penh are inland terminals 20 km–40 km away from central Phnom Penh, not on the Mekong River coast. As for location, delivery can be done to Battambang, Phnom Penh, and Siem Reap without traffic congestion. The two new terminals are the second terminals, and the petroleum products will be transferred from Sihanoukville. Tank trucks seem to be the means of transfer for the time being, but pipeline and railway may be the options in the future.

The quantity that can be delivered from the terminal is calculated by the storage capacity and the combination of the frequency of arrival and the size of the receiving tankers, the number of shipping lanes, and the frequency of shipping per day. In the future, if demand more than doubles, the first response is to increase the shipping lanes and increase the shipping frequency. The second is to increase storage capacity accordingly, but adding large tanks and increasing the size of receiving ships reduce the frequency of arrivals and allow the oil company to enjoy the cheap freight of large tankers.

**Table 4.3 Storage Capacity of Expansion Plan, by Location (Summary)**

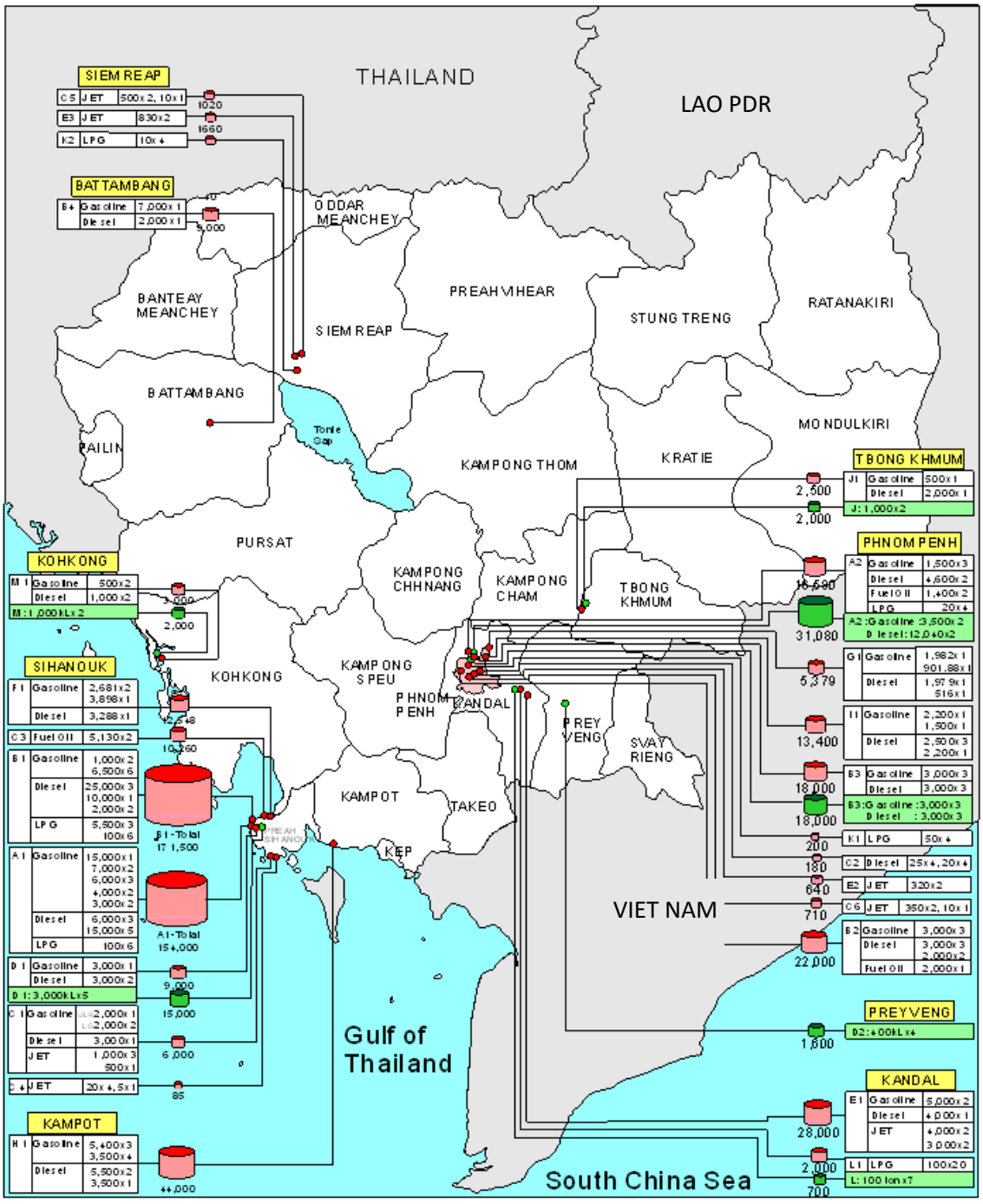
until kl

| Location | Terminal | Gasoline | Diesel Oil | Fuel Oil | Total Capacity |
|---|---|---|---|---|---|
| Sihanoukville | 1 | | | | 15,000 |
| Phnom Penh | 2 | 16,000 | 33,080 | | 49,080 |
| Kandal | 1 | | | | 700 |
| Prey Veng | 1 | | | | 1,600 |
| Koh Kong | 1 | | | | 2,000 |
| Tbong Khmom | 1 | | | | 2,000 |
| kl = kilolitres. | | | | **Total** | **70,380** |

Source: This project.

Figure 4.1 shows Cambodia's oil storage tanks on a map.

**Figure 4.1. Cambodia Oil Terminal Map**




Source: This project, 2020.

## 2. Current Supply Chain of Petroleum Products in Cambodia

### 2.1 Import route

Currently, all petroleum products are imported, and import terminals are located in Sihanoukville, Kampot, Koh Kong along the Gulf and Phnom Penh, and Kandal along the Mekong River. According to Cambodia's import data (based on customs statistics) released by the ITC (International Trade Centre[1]) statistics of international trade 2020, import volume from Viet Nam in 2018 accounted for about 35%. Imports from Viet Nam are accepted at the terminal in Phnom Penh and Kandal via the Mekong River. Therefore, the remaining 65% is expected to be imported to the coastal terminals of Sihanoukville, Kampot, and Koh Kong.

Almost the same composition ratio is obtained from the results of the delivery volume survey by each terminal of oil companies. The delivery volume from Sihanoukville terminals accounts for 56%. Phnom Penh, the region with the largest demand, is close to the oil terminals along the Mekong River in Phnom Penh and Kandal. However, due to the limited size of oil tankers and terminals, the supply volume from Sihanoukville is high. Freight varies depending on the size of tankers used to import petroleum products. For example, small tankers of 1,000–2,000 tonnes are used for the Phnom Penh and Kandal terminals via the Mekong River.

On the other hand, large tankers of 5,000–10,000 tonnes are used for Sihanoukville. Although the tanker freight fluctuates depending on the supply and demand of ships, the freight difference depending on the tanker size is four to five times. Still, it is actually about two times because Viet Nam is closer than Singapore and Thailand.

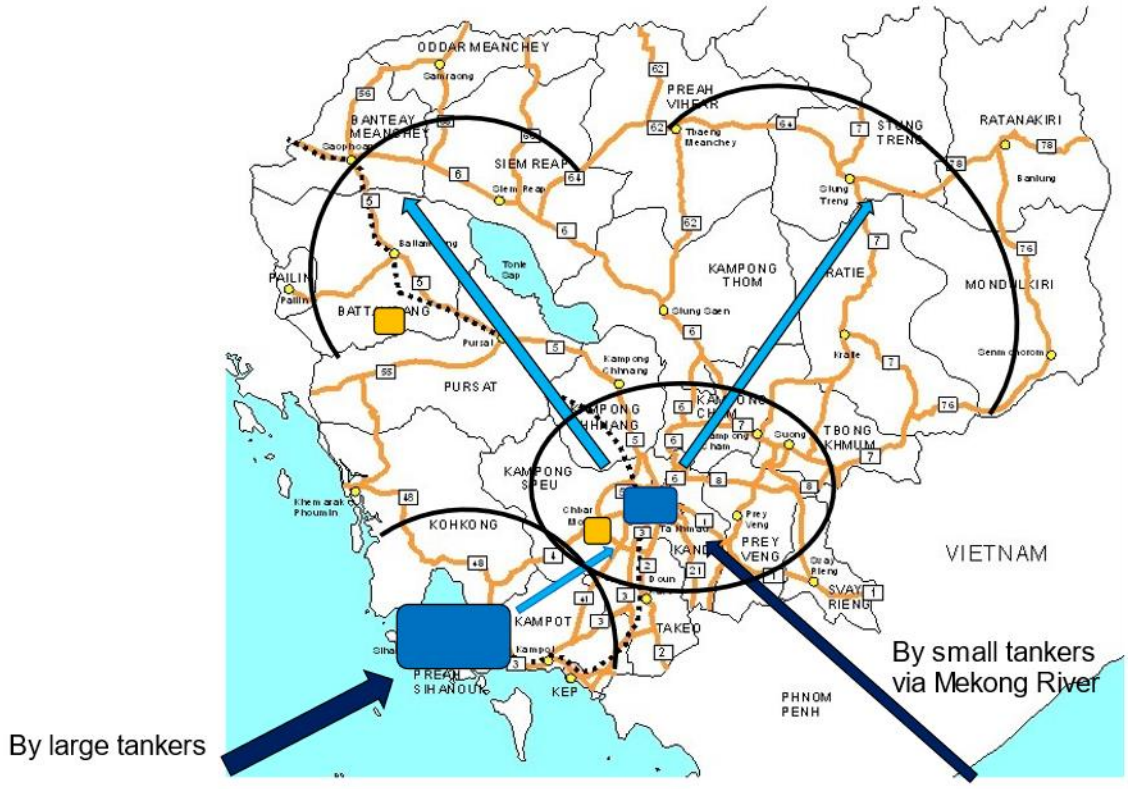
In this project, GDP/MME (General Department of Petroleum, The Ministry of Mines and Energy) and ERIA conducted survey on petroleum companies in 2020 regarding current supply chain nationwide.

[1] The International Trade Centre (ITC), a joint organisation of the United Nations and World Trade Organization, provides international trade statistics.

### 2.2 Delivery route

Phnom Penh is the centre of Cambodia, and its trunk roads are also concentrated, so delivery from Phnom Penh and Kandal oil terminals is efficient in terms of time and distance. Therefore, the direct delivery area from Sihanoukville is limited to Kampot, Keb, Koh Kong, Kampong Speu, and Takeo, near Sihanoukville. However, some oil companies deliver directly to Battambang and Siem Reap. There are also cases of direct delivery from Sihanoukville and the second delivery from the Phnom Penh terminal. The second delivery means transfer from the Sihanoukville terminal to the Phnom Penh hub terminal. Delivery to the north-eastern provinces is from Phnom Penh and Kandal terminals (Figure 4.2).

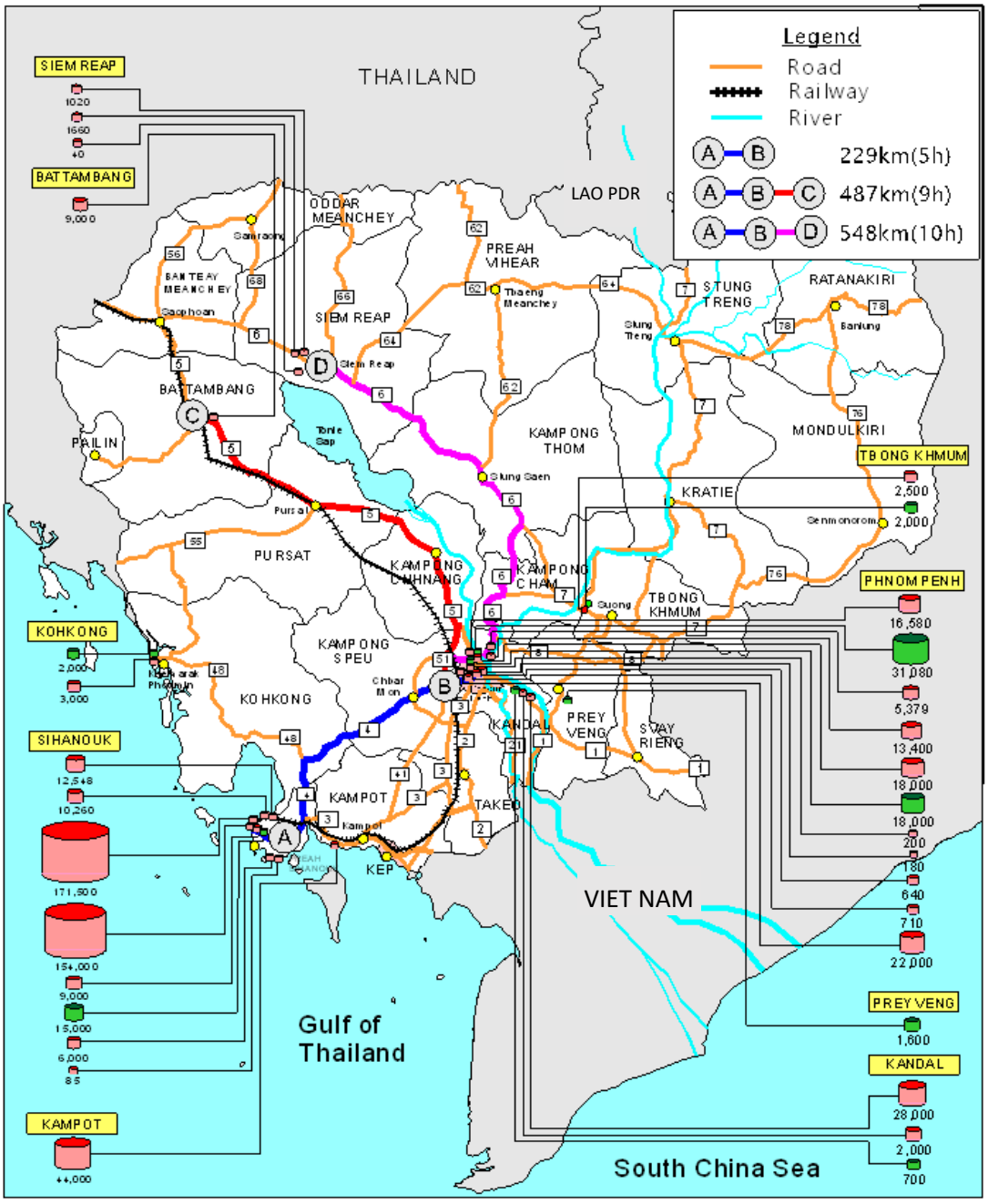
**Figure 4.2. Delivery Routes Nationwide**




Source: This project, 2020.

For the driver's health, the maximum daily delivery distance of a tank truck is about 250 km. Therefore, it takes 2 days to Battambang and Siem Reap, which are 500 km from Sihanoukville, and 2 days to return. In some cases, drivers change en route, but it takes 4 days to make a round trip. On the other hand, transfer to the terminal in Phnom Penh, 230 km from Sihanoukville, takes 1 day by tank truck, and 1 day from Phnom Penh to Battambang and Siem Reap. In any case, the delivery from Sihanoukville to Battambang and Siem Reap takes 4 days, which is the same. However, oil companies prefer transfer cases to prevent the long working hours of drivers.

**Figure 4.3 Delivery by Tank Truck and Railway**




Source: This project, 2020.

### 2.3 Delivery by railway

Two oil companies transport petroleum products from Sihanoukville to Phnom Penh by railway. Railway transportation from Sihanoukville to Phnom Penh takes 2 days (round trip), and the transportation volume is 1,800 kl (60 kl x 30 trains) for one trip.

Transport from Phnom Penh to the Battambang hub terminal also takes 2 days.

Cambodia has two railway lines:

- North Line: Phnom Penh to Battambang, 273 km
- Phnom Penh to Aranyaprathet in Thailand, 390 km
- South Line: Phnom Penh to Sihanoukville, 267 km

The deterioration of rails and rolling stock makes it challenging to increase transportation and speed up. Still, it is expected to improve in the future under a longitudinal railway system for Southeast Asia.[2]

Transportation of petroleum products by railway, including from Sihanoukville to Battambang, is promising.

### 2.4 Transfer from Sihanoukville terminal to Phnom Penh terminal

Two transfer methods from Sihanoukville to Phnom Penh currently exist: (i) tank-truck transportation which takes 1 day and needs another day for return; and (ii) railway transportation, which also needs 1 day and occurs once a week.

According to the delivery survey, the total transfer volume of gasoline and diesel oil from the Sihanoukville terminal to the Phnom Penh terminal is about 660,000 kl/year. Transfer by tank truck requires more than 100 tank trucks per day. There are other transfers – from Sihanoukville to terminals in Prey Veng and Battambang, and from Koh Kong to Sre Ambil – but not in large quantity.

[2] China–Viet Nam–Lao PDR–Cambodia–Thailand–Malaysia–Singapore

## 3. Current Supply Chain Issues

All petroleum products comprising Cambodia's oil supply are imported. The distance from Sihanoukville, the largest import base, to the provinces around Phnom Penh, Battambang, and Siem Reap in the west, the main demand areas, is far. Also, the means of transportation mainly depends on the tank trucks.

As explained in Chapter 5.2, demand for petroleum products in 2040 is expected to be more than triple of in 2018. Above all, the demand of Phnom Penh will expand, and the demand composition ratio of gasoline and diesel oil is assumed to be 25.7% (Tables 4.4 and 4.5).

Therefore, the biggest challenge in 2040 is how to supply petroleum products to Phnom Penh and its neighbouring provinces.

The second challenge is to supply petroleum products to Battambang and Siem Reap, which have the next-largest demand. The two provinces are far from Sihanoukville and Phnom Penh.

**Table 4.4. Total demand of Gasoline and Diesel Oil, by Province, in 2030 and 2040**

| Province | Gasoline + Diesel Oil (kl) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2018 | % | 2030 | % | 2040 | % | 2018-2040 |
| Banteay Meanchey | 129,522 | 5.3 | 253,343 | 5.5 | 455,261 | 5.8 | 5.9 |
| Battambang | 215,042 | 8.8 | 314,843 | 6.9 | 559,018 | 7.2 | 4.4 |
| Kampong Cham | 127,409 | 5.2 | 199,215 | 4.3 | 334,100 | 4.3 | 4.5 |
| Kampong Chhnang | 68,183 | 2.8 | 120,381 | 2.6 | 208,699 | 2.7 | 5.2 |
| Kampong Speu | 52,902 | 2.2 | 101,502 | 2.2 | 174,750 | 2.2 | 5.6 |
| Kampong Thom | 75,939 | 3.1 | 127,445 | 2.8 | 225,422 | 2.9 | 5.1 |
| Kampot | 30,875 | 1.3 | 49,723 | 1.1 | 84,898 | 1.1 | 4.7 |
| Kandal | 176,039 | 7.2 | 313,542 | 6.8 | 520,499 | 6.7 | 5.1 |
| Kohkong | 9,335 | 0.4 | 15,503 | 0.3 | 26,971 | 0.3 | 4.9 |
| Kratie | 79,511 | 3.2 | 147,736 | 3.2 | 252,724 | 3.2 | 5.4 |
| Mondolkiri | 48,968 | 2.0 | 106,612 | 2.3 | 183,546 | 2.4 | 6.2 |
| Phnom Penh | 566,751 | 23.1 | 1,226,439 | 26.8 | 2,006,053 | 25.7 | 5.9 |
| Preah Vihear | 54,709 | 2.2 | 119,745 | 2.6 | 209,883 | 2.7 | 6.3 |
| Prey Veng | 89,728 | 3.7 | 160,305 | 3.5 | 273,086 | 3.5 | 5.2 |
| Pursat | 94,187 | 3.8 | 153,590 | 3.4 | 267,816 | 3.4 | 4.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ratanakiri | 49,260 | 2.0 | 103,739 | 2.3 | 169,798 | 2.2 | 5.8 |
| Siem Reap | 196,334 | 8.0 | 348,007 | 7.6 | 608,139 | 7.8 | 5.3 |
| Preah Sihanouk | 61,264 | 2.5 | 128,625 | 2.8 | 219,457 | 2.8 | 6.0 |
| Stung Treng | 34,682 | 1.4 | 74,555 | 1.6 | 130,909 | 1.7 | 6.2 |
| Svay Rieng | 68,403 | 2.8 | 118,940 | 2.6 | 202,952 | 2.6 | 5.1 |
| Takeo | 55,167 | 2.2 | 95,382 | 2.1 | 158,936 | 2.0 | 4.9 |
| Oddar Meanchey | 44,235 | 1.8 | 93,814 | 2.0 | 167,202 | 2.1 | 6.2 |
| Kep | 2,105 | 0.1 | 3,980 | 0.1 | 6,561 | 0.1 | 5.3 |
| Pailin | 22,548 | 0.9 | 35,108 | 0.8 | 63,047 | 0.8 | 4.8 |
| Tbong Khmum | 104,164 | 4.2 | 168,380 | 3.7 | 289,014 | 3.7 | 4.7 |
| **Cambodia total** | **2,457,262** | **100.0** | **4,580,455** | **100.0** | **7,798,740** | **100.0** | **5.4** |

Source: This project (2020).

Total demand for gasoline and diesel oil in Phnom Penh will increase from 566,751 kl in 2018 to 1,226,439 kl in 2030 to 2,006,053 kl in 2040. Also, the total demand of gasoline and diesel oil in the neighbouring provinces of Phnom Penh, the so-called Central Plain – Kampong Cham, Tbong Khmum, Kandal, Phnom Penh, Prey Veng, Svay Rieng, and Takeo – will increase.

**Table 4.5 Demand Composition Ratio, by Province in 2030 and 2040**

| Composition Ratio, % | Gasoline | | | Diesel Oil | | |
|---|---|---|---|---|---|---|
| | 2018 | 2030 | 2040 | 2018 | 2030 | 2040 |
| Banteay Meanchey | 1.5 | 1.5 | 1.5 | 7.2 | 7.8 | 7.8 |
| Battambang | 3.6 | 3.0 | 3.0 | 11.3 | 9.1 | 9.1 |
| Kampong Cham | 6.0 | 5.2 | 5.2 | 4.8 | 3.9 | 3.9 |
| Kampong Chhnang | 2.1 | 2.0 | 2.0 | 3.1 | 3.0 | 3.0 |
| Kampong Speu | 1.9 | 1.9 | 1.9 | 2.3 | 2.4 | 2.4 |
| Kampong Thom | 1.5 | 1.4 | 1.4 | 3.9 | 3.6 | 3.6 |
| Kampot | 1.2 | 1.0 | 1.0 | 1.3 | 1.1 | 1.1 |
| Kandal | 9.7 | 9.1 | 9.1 | 5.9 | 5.6 | 5.6 |
| Kohkong | 0.3 | 0.2 | 0.2 | 0.4 | 0.4 | 0.4 |
| Kratie | 3.1 | 3.0 | 3.0 | 3.3 | 3.3 | 3.3 |
| Mondolkiri | 1.8 | 2.0 | 2.0 | 2.1 | 2.5 | 2.5 |
| Phnom Penh | 37.4 | 40.5 | 40.5 | 15.9 | 18.9 | 18.9 |
| Preah Vihear | 1.5 | 1.6 | 1.6 | 2.6 | 3.2 | 3.2 |
| Prey Veng | 3.7 | 3.5 | 3.5 | 3.6 | 3.5 | 3.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pursat | 2.5 | 2.3 | 2.3 | 4.5 | 4.0 | 4.0 |
| Ratanakiri | 3.2 | 3.4 | 3.4 | 1.4 | 1.6 | 1.6 |
| Siem Reap | 5.2 | 5.0 | 5.0 | 9.4 | 9.1 | 9.1 |
| Preah Sihanouk | 2.6 | 2.7 | 2.7 | 2.5 | 2.9 | 2.9 |
| Stung Treng | 0.9 | 1.0 | 1.0 | 1.7 | 2.0 | 2.0 |
| Svay Rieng | 2.7 | 2.5 | 2.5 | 2.8 | 2.6 | 2.6 |
| Takeo | 2.9 | 2.7 | 2.7 | 1.9 | 1.8 | 1.8 |
| Oddar Meanchey | 0.7 | 0.8 | 0.8 | 2.3 | 2.8 | 2.8 |
| Kep | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Pailin | 0.2 | 0.2 | 0.2 | 1.3 | 1.1 | 1.1 |
| Tbong Khmum | 3.7 | 3.3 | 3.3 | 4.5 | 3.9 | 3.9 |
| **Cambodia total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

Source: This project (2020).

The following sections discuss the issues to consider in the stable and efficient oil supply in 2030 and 2040.

### 3.1 Limits of oil terminals along the Mekong River

The delivery from oil terminals along the Mekong River to the Central Plain is efficient in time and distance. However, since the terminal is close to the city, it is difficult to expand the terminal capacity; there is also the problem of traffic jam. Moreover, the water depth is shallow, so it is impossible to import by large oil tankers. Therefore, tripling the delivery volume for 2040 is very difficult. On the other hand, there are plans to establish two second terminals near Phnom Penh, each 20 km to 40 km away from Phnom Penh. In this way, it is effective to establish new second terminals near Phnom Penh and transfer to each province from the Sihanoukville terminals.

### 3.2 Transfer method from Sihanoukville terminal to Phnom Penh second terminal

Transfer from the Sihanoukville terminal to the Phnom Penh second terminals could be done through tank trucks, railroads, and pipelines.

Which method to choose is determined comprehensively based on economics, safety, and environmental issues. However, it is essential to consider economics first.

In phase 2, the necessary transport volume, transport distance, and unit cost of each means are assumed, and a comparative study is performed.

### 3.3 Delivery to provinces near the Thai–Viet Nam border

Around the Thai–Viet Nam border provinces are 400 km to 500 km from Sihanoukville and Phnom Penh. Since demand in these provinces will also increase in 2030 and 2040, second terminals along the main road around the Thai–Viet Nam border should be considered. Petroleum products can be transferred from Sihanoukville or Phnom Penh.

In this project, GDP/MME (General Department of Petroleum, The Ministry of Mines and Energy) and ERIA conducted survey on petroleum companies in 2020 regarding current supply chain nationwide.