Chapter 7

Conclusions

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According to the Cambodia energy statistics 2010–2018, the demand for petroleum products was dominant and increased at around 8.3% per year from 2010–2018. The major petroleum products were diesel oil and gasoline, used mainly for vehicle transport. This petroleum demand is projected to increase 1.8 times from 2018 to 2030 and 3.2 times to 2040, according to the Cambodia energy outlook 2019. Consequently, the current petroleum supply chain to support the transportation of petroleum products from primary terminals to tertiary terminals in each province will be resilient, applying the current land transportation mode (tank truck) and the pipeline, railway, and highway systems as well as secondary storages.

Next, this study divided future gasoline and diesel oil demand at the national level into each province. Therefore, this study used sales data from oil companies in Cambodia and estimated the consumption of petroleum products at the provincial level based on the energy consumption survey results. The energy consumption survey was successful but the estimation of petroleum product consumption did not succeed due to the lack of provincial macroeconomic information and data on vehicle ownership . Finally, this study chose the estimation results of provincial petroleum product demand based on the oil company data.

In addition, through interviews of oil companies, the current petroleum supply chain which represents transportation of petroleum products from primary terminals to each province was reviewed.

Finally, this study simulated future petroleum supply chain applying the cost minimum approach (linear programming method) based on several given data:(i) future petroleum demand in each province in 2030 and 2040; (ii) supply constraint on primary terminals (Sihanoukville and Mekong River); (iii) unit transportation cost of tank truck, railway, highway and pipeline, and other parameters such as import freight. Firstly, this study produced the BAU scenario of 2030; it also reflected the current supply chain system, and conducted several case studies to include the new transport system, such as the enhanced Mekong River terminal and the rehabilitated

railway and pipeline, to seek for resilient petroleum supply chain in 2030 and 2040. As a results, the cost minimum approach was suggested: (i) in 2030, a pipeline between Sihanoukville and Phnom Penh could contribute to minimising the national logistic cost of petroleum products, (ii) in 2040, the enhancement of Mekong River storages and the rehabilitated railway system between Sihanoukville and Battambang could contribute to minimising the national oil logistic cost.

If the current land transport system can transport petroleum products from the primary terminals to each province in 2030, direct delivery from Sihanoukville will cover around half of the total petroleum product amount in 2030, and the delivery amount from Sihanoukville to Phnom Penh will be significant. Therefore, this system will not be resilient because of many issues – the need for a remarkable number of tank-trucks and shipping lanes at primary terminals and tank truck drivers to engage in long-distant driving.

If a pipeline system will apply between Sihanoukville and Phnom Penh, direct delivery from Sihanoukville will sharply go down. On the other hand, the pipeline system will take the highest share (66.3%), followed by direct delivery from the Mekong River terminal. Thus, the issues mentioned above will be solved but certain amounts of shipping lanes will still be necessary at the secondary terminal near Phnom Penh. The pipeline system will also accomplish a significant cost down of petroleum logistics in the whole of Cambodia.

On the other hand, the construction of the pipeline system between Sihanoukville and Phnom Penh, which is almost 220 km, will need a certain amount of investment (US$200–US$240 million). Thus, at least more than 2 million kl per year of oil demand, consisting mainly of gasoline and diesel oil, will be indispensable. In addition, safety regulations to cover both construction and operation of the pipeline should be formulated under the leadership of the General Department of Petroleum/MME, Cambodia.

The cost minimum approach was implemented to simulate petroleum transportation from the primary terminals to each province with the view of economic rationale. However, actual petroleum transportation does not follow economic rational behavior 100% and includes historical business practices. Nevertheless, under these conditions, the cost minimum approach can provide us with many meaningful outputs, and these outputs will surely contribute to formulating appropriate petroleum supply chain policies to be responded by the General

Department of Petroleum/MME. These policies will also be a good feedback to oil companies in Cambodia.