

Chapter 1

Review of Current and Future Petroleum Demand

February 2022

This chapter should be cited as

ERIA Study Team (2022), 'Review of Current and Future Petroleum Demand', 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.1-12.

Chapter 1

Review of Current and Future Petroleum Demand

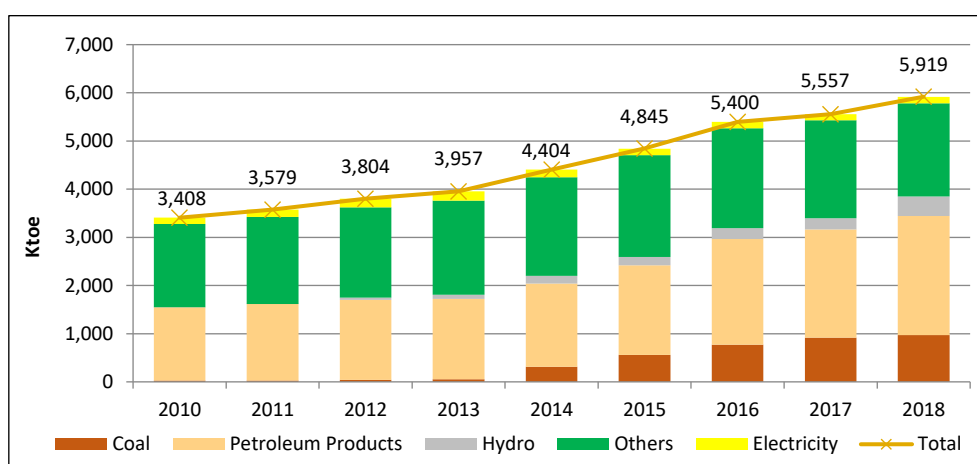
1. Total Primary Energy Supply, by Energy

Cambodia's total primary energy supply (TPES) increased from 3,408 ktoe in 2010 to 5,919 ktoe in 2018, at an annual average rate of 7.1% per year (Figure 1.1). However, most of the TPES (51%) in 2010 came from 'Others', where biomass was dominant. By 2018, the share had decreased to 33%. Cambodia shifted from non-commercial energy to commercial energy (oil and electricity), especially in the residential sector, while biomass grew only 1.4% per year.

Oil had the highest share in the TPES in 2018 (42%) as its demand increased with the number of vehicles. Oil supply grew at an average 6% per year over 2010–2018. Between 2017–2018, the growth was almost 10%, indicating a rapid increase in the road transport demand of gasoline and diesel oil.

Hydro supply share in the TPES was 7% in 2018. Although small, hydro supply increased the fastest at 74.7% in 2017–2018. On the other hand, coal supply increased by 6.2% between 2017 and 2018, while the import of electricity supply increased by 8.9% in the same period.

Figure 1.1. Total Primary Energy Supply, 2010–2018



Ktoe = kiloton of oil equivalent.

Source: MME (2020).

2. Total Final Energy Consumption, by Energy and Sector

Cambodia's total final energy consumption (TFEC) increased steadily by an average 7.2% per year from 2,461 ktoe in 2010 to 4,297 ktoe in 2018 (Figure 1.2). The commercial sector grew at 18.8% per year on average over the 2010–2018 period, as reflected by the opening of new buildings due to a remarkable influx of foreign direct investment for the construction of commercial buildings.

Transport sector consumption also grew faster than the TFEC at an annual 7.4% per year, while the industry and residential sectors grew more slowly at 5.1% and 3.3% per year, respectively. Although

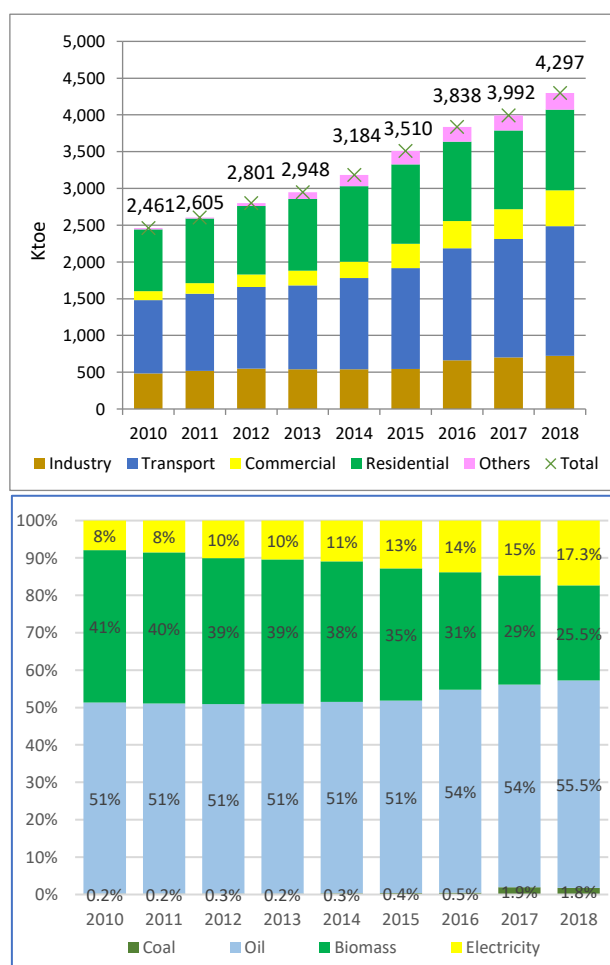
the commercial sector grew fast, its share in the TFEC was only 11% in 2018. The transport sector has always been dominant; its share in the TFEC was 40% in 2010 and 41% in 2018.

Oil is the fuel consumed by the transport sector. Thus, by fuel type, oil consumption has the highest share in the TFEC (51% in 2010 and 55.5% in 2018). Total oil consumption increased at an average annual rate of 8.3%, from 1,258 ktoe in 2010 to 2,383 ktoe in 2018.

Electricity consumption grew faster than oil, at an average annual rate of 18.3% over the 2010–2018 period, in line with the increase in commercial sector consumption, most of which is electricity. Thus, the share of electricity in the TFEC increased from 8% in 2010 to 17% in 2018.

Coal is consumed only in the industry sector. The consumption increased by almost 39% over 2010–2018, especially for cement production. Although it recorded the fastest growth, coal constituted less than 2% of the TFEC in 2018. The residential sector mainly consumed biomass. As household income increased, especially in the urban areas, more efficient fuels, such as liquefied petroleum gas (LPG) and electricity, replaced biomass. Thus, biomass consumption grew slower than the other fuels, at an average rate of 1.1% per year. As a result, the share of biomass in the TFEC fell from 41% in 2010 to 25.5% in 2018.

Figure 1.2. Total Final Energy Consumption, by Sector and by Fuel, 2010–2018



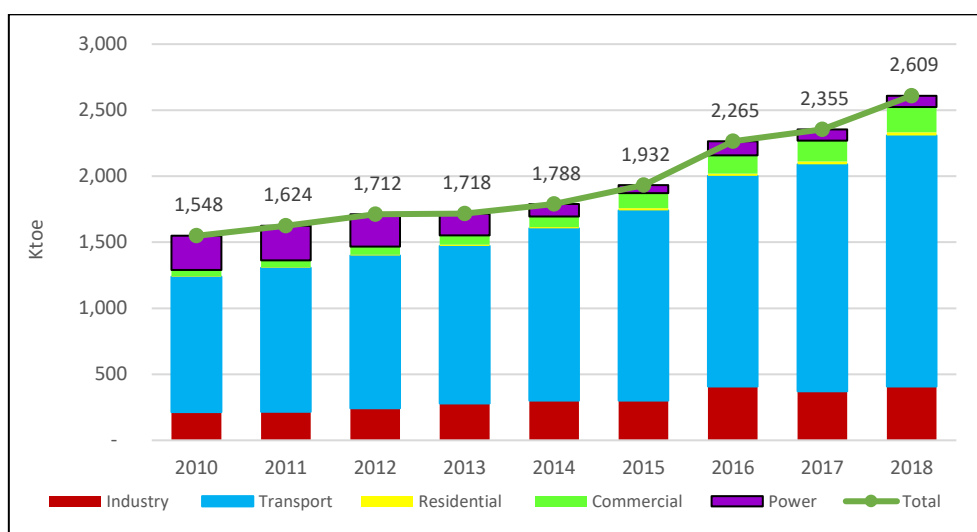
Ktoe = kiloton of oil equivalent.
Source: MME (2020).

3. Oil Consumption in Cambodia

3.1. By sector

The country's total oil consumption by sector increased from 1,548 ktoe in 2010 to 2,609 ktoe in 2018 (Figure 1.3). The average annual growth rate was 6.7% over the 2010–2018 period. Consumption grew faster between 2017 and 2018 at 10.8%, indicating an increasing number of vehicles in the road transport sector. As a result, the transport sector's share in total oil consumption reached 73% in 2018. This includes the oil used for international aviation bunkers. The remaining shares were those of the industry (16%), residential (1%), commercial (7%), and power generation (3%) sectors.

Figure 1.3 Oil Consumption, by Sector, 2010–2018



Ktoe = kiloton of oil equivalent.
Source: MME (2020).

3.2. By product

By product, Cambodia's oil consumption was dominated by diesel oil, with a share of almost 55% in 2018 (Figure 1.4). Diesel oil consumption increased at an annual average of 10%, from 610 ktoe in 2010 to 1,307 ktoe in 2018. Most of the consumption was in the transport sector; its use included boilers and standby generators in the industry and commercial sectors.

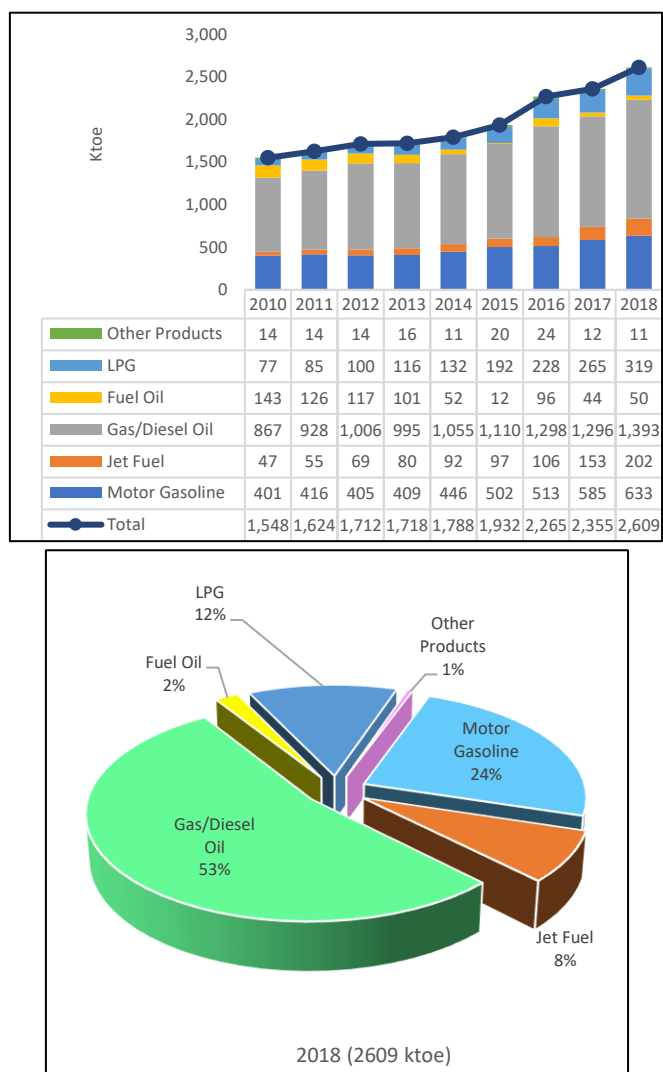
Gasoline was another product mainly used for road transport. The share of gasoline in the total oil consumption was the second highest (27% in 2018). Gasoline consumption increased at an average rate of 6% per year, slower than diesel oil.

Jet fuel experienced the fastest growth (20% per year) in line with the increase in domestic and international flights. Although showing the fastest growth, the share in the total oil consumption was around 8% in 2018.

Liquefied petroleum gas (LPG) is the other product with fast growth over 2010–2018 (19.5% per year). LPG consumption had been increasing rapidly as a substitute for biomass, mainly in the commercial sector. The transport sector (taxis and three-wheelers) and the residential sector also consumed LPG. LPG's share in the commercial sector was around 60% of total LPG consumption in 2018. In total oil consumption, the share of LPG increased from 6% in 2010 to 13% in 2018.

The remaining products were fuel oil and other petroleum products with a combined share of 2.6% in total oil consumption. These products were consumed by the industry, transport, and power sectors.

Figure 1.4. Oil Consumption, by Product Type, 2010–2018



Ktoe = kiloton of oil equivalent, LPG = liquefied petroleum gas.
Source: MME (2020).

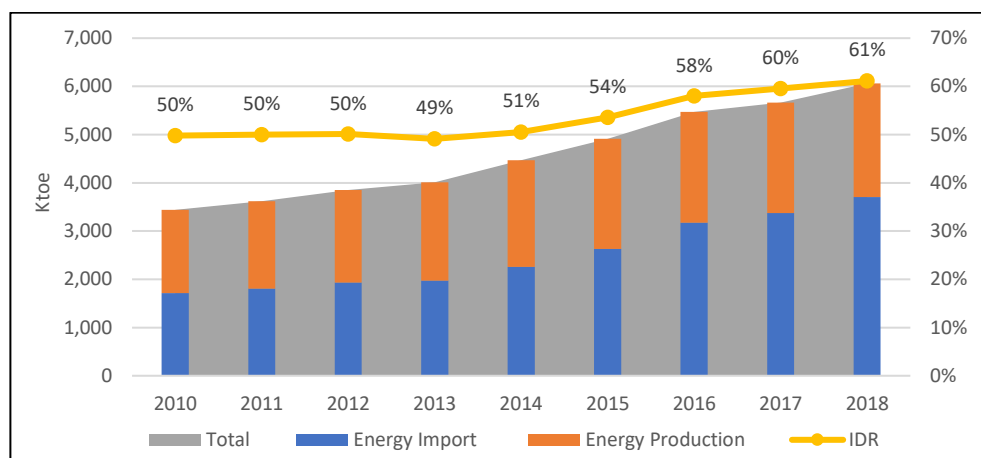
4. Import Dependency

Cambodia imports oil, coal, and electricity. Total energy import increased from 1,712 ktoe to 3,703 ktoe in 2010–2018, at an average rate of 10% per year. Domestic energy production (biomass and hydro), on the other hand, increased by only 4% per year. The resulting import dependency, which is the ratio of import to total (import + production), increased from 50% in 2010 to 61% in 2018 (Figure 1.5).

Cambodia imported 100% of its petroleum products from Singapore, Thailand, and Viet Nam to supply domestic consumption. These imported petroleum products increased at an average rate of 7% in 2010–2018. Between 2017 and 2018, the increase was 11%. The rapid increase of jet fuel and LPG

resulting from increased air traffic, commercial, residential, and road transport largely contributed to the high growth of imported petroleum products in 2017 and 2018.

Figure 1.5 Import Dependency Ratio, 2010–2018

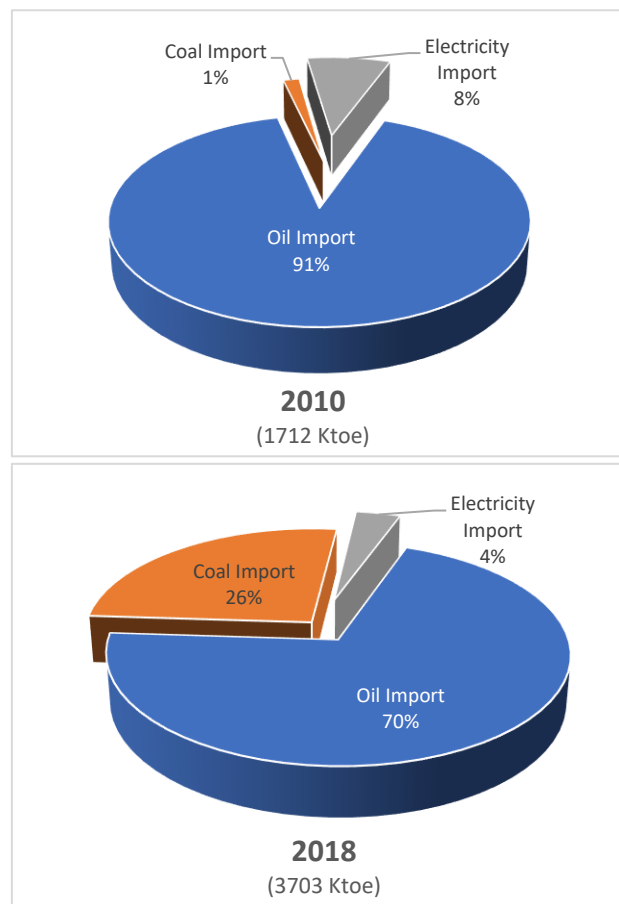


Ktoe = kiloton of oil equivalent, IDR = import dependency ratio.
Source: MME (2020).

Compared to the other fuel imports (coal and electricity), oil imports constituted 91% of total imported fuel in 2010 (Figure 1.6). However, in 2018, the imported share of oil declined to 70% due to the rapid increase of coal imports (58% per year). This rapid growth of coal imports was due to the increasing demand for power generation.

Electricity import was necessary to avoid frequent power shortages in the dry season. Cambodia’s reliance on hydropower created a supply vulnerability caused by seasonal changes. The inclusion of coal in the generation mix complements hydropower generation. This will further secure the country’s supply mix and address short-term needs during the dry season. Compared to 2010, electricity imports in 2018 increased slightly (1.7 ktoe) at an average rate of 0.2% per year. Consequently, the share of electricity imports in total energy imports decreased to 4% in 2018.

Figure 1.6 Energy Import, by Fuel Type, 2010 and 2018



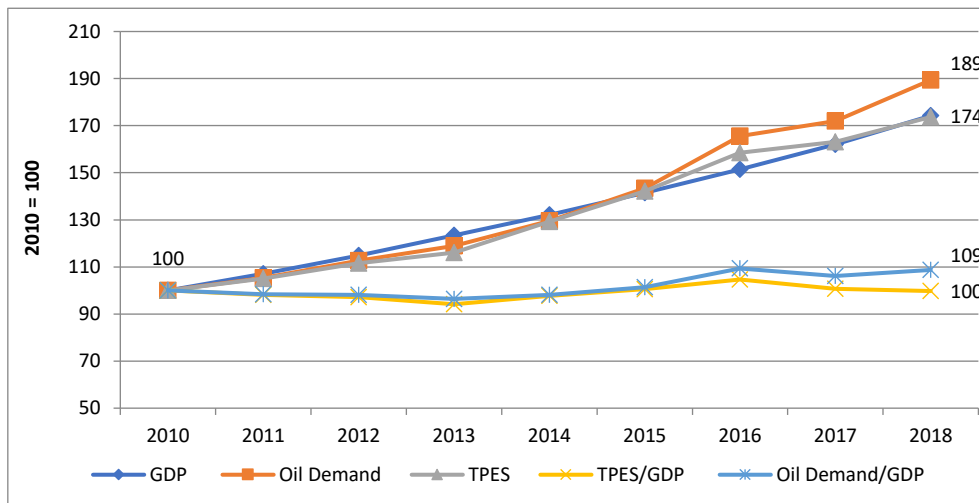
Ktoe = kiloton of oil equivalent.
Source: MME (2020).

5. Energy Intensity (Petroleum Demand/GDP, TPES/GDP)

Oil demand increased faster than the TPES in 2010–2018 (Figure 1.7). By 2018, oil demand had grown 1.9 times that of 2010, while the TPES was only 1.7 times that of 2010. Compared to the gross domestic product (GDP), TPES growth was the same as GDP. As a result, the primary energy intensity, defined as TPES divided by GDP, did not change.

The demand intensity of oil in 2018 increased by 1.1 times from 2010 as transport demand grew faster than GDP.

Figure 1.7. Energy Intensity, 2010–2018



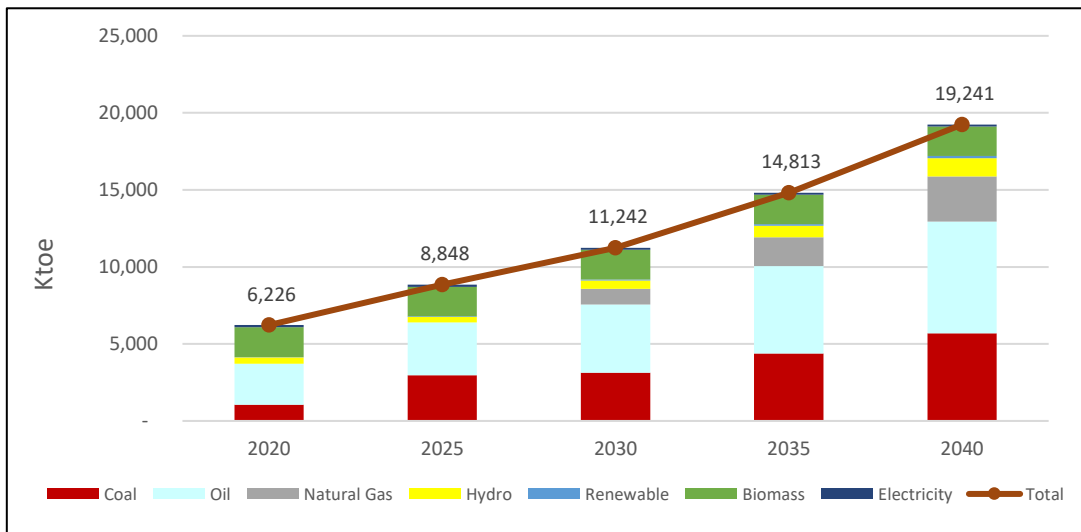
GDP = gross domestic product, TPES = total primary energy supply.
Source: MME (2020).

6. Business-As-Usual Scenario (BAU) up to 2040

The Business-as-Usual Scenario (BAU) was based on the Cambodia country result for the East Asia Summit energy outlook 2020, published by ERIA (Kimura and Han, 2021). This outlook used 2018 as the base year, and demand had been forecasted up to 2050 based on the government’s specific socio-economic assumptions and existing energy policies. The BAU scenario result for 2040 is used in this study.

Cambodia’s TPES is forecast to reach 19,241 ktoe in 2040, growing at an average annual rate of 5.5% (Figure 1.8). Oil has the highest share in TPES over the projection period. However, the share is expected to decrease from 42% in 2018 to 38% in 2040 since other fuels (coal and renewable) will be growing faster than oil. Oil supply will increase at an average rate of 5% per year over the 2018–2040 period. Coal will grow at an average 8.4% per year while renewables will grow by 24% per year. The rapid increase of coal and renewables is in line with the plan to increase coal and renewable power (solar and wind) capacity to meet the increase in electricity demand.

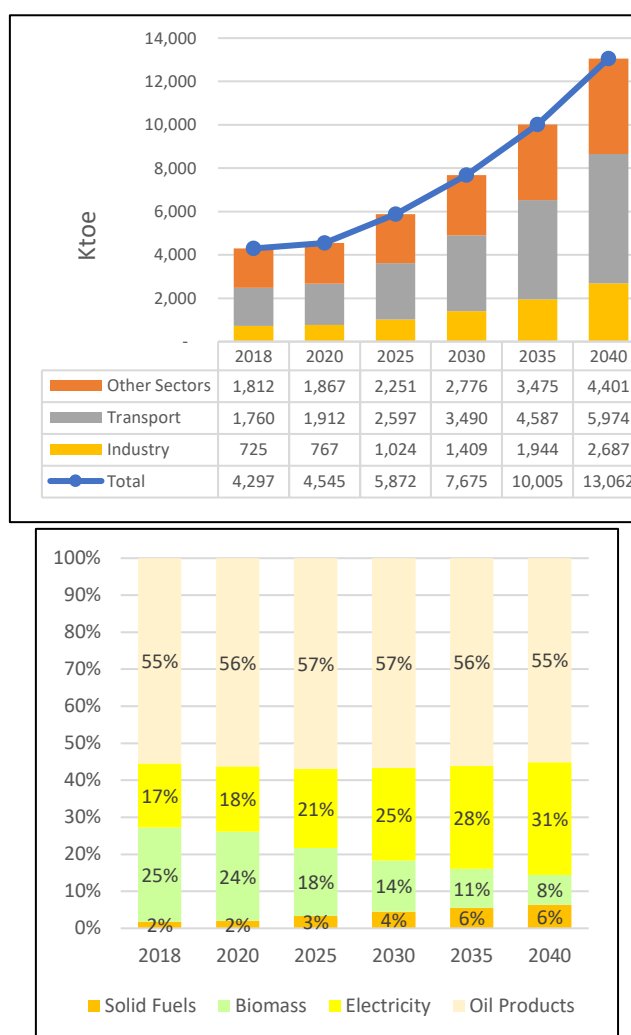
Figure 1.8. Total Primary Energy Supply, 2018–2040



Ktoe = kiloton of oil equivalent, TPES = total primary energy supply.
 Source: Kimura and Han (eds.) (2021).

In BAU, driven by assumed strong economic growth and an increasing population, the TFEC is projected to increase to 13,062 ktoe by 2040 at an average annual rate of 5.2% (Figure 1.9). By fuel, oil will dominate the TFEC in 2040 at a share of 55% while biomass share will decline to 8%.

Figure 0.9. Total Final Energy Consumption, BAU



Ktoe = kiloton of oil equivalent.

Source: Kimura and Han (eds.) (2021).

Cambodia’s total oil demand will grow at an average rate of 5,4% per year over the projected period and reach 8,301 ktoe in 2040 (Figure 1.10). This will be the demand for the final sector (including international aviation) and the power sector (oil input for generating electricity). Most of the oil demand will still be from the transport sector, with a share reaching 83% of total oil demand in 2040. The oil demand of the transport sector will grow at an average annual rate of 6,1% and will reach 6,926 ktoe by 2040.

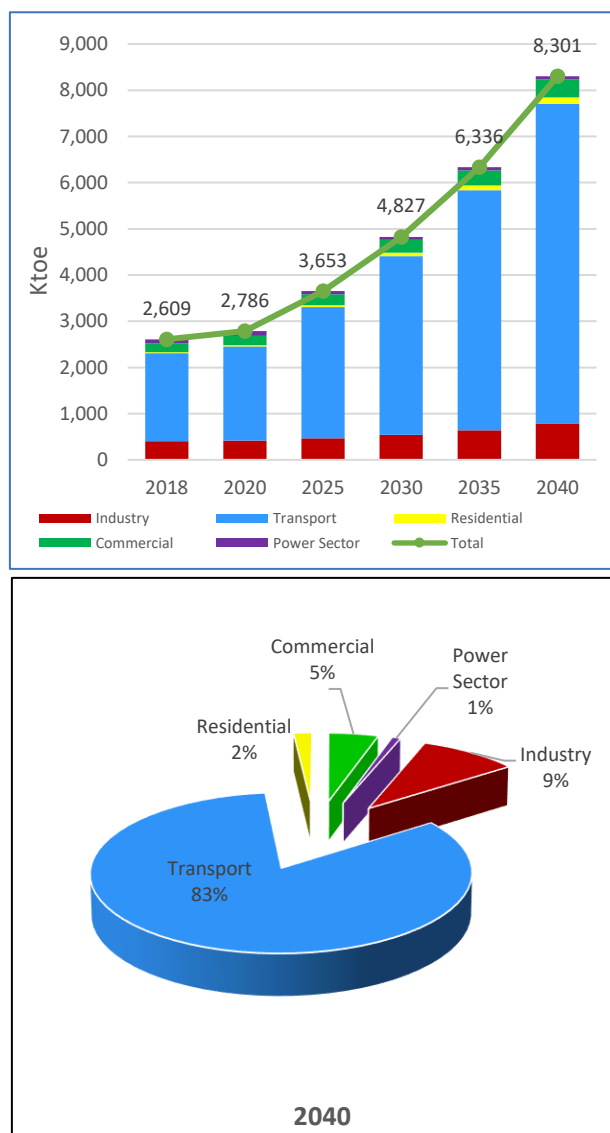
The smallest oil demand will be that of the power sector. The share of power sector demand in total oil demand will be around 1% in 2040; in 2018, the share was around 3.3%. The average growth rate of power sector oil demand will be –1.1% per year over the projection period (2018–2040),

The oil demand of the industry sector is projected to increase to around 781 ktoe by 2040, growing at an average annual rate of 3% over the projection period. The industry sector share in total oil demand is forecast to be around 9% in 2040, while that of the commercial sector is expected to be 5% in

2040. Commercial sector oil demand is projected to grow at an average rate of 3.2% per year between 2018 and 2040.

The oil demand of the residential sector will only be around 2% of total oil demand, but it is expected to grow fastest at 8.2% per year. This rapid growth is due to the increase of LPG demand as a substitute for biomass

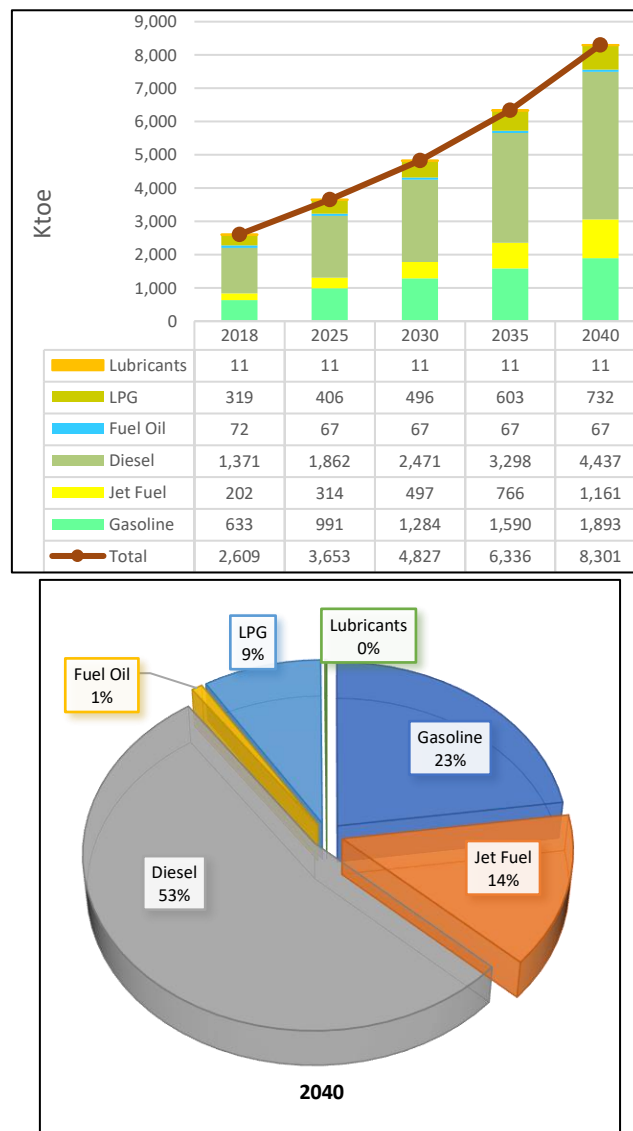
Figure 0.10. Oil Demand Projection, by Final Sector, BAU, 2018–2040



Ktoe = kiloton of oil equivalent.
Source: Kimura, S. and P. Han (eds.) (2021).

Jet fuel demand will grow fastest at 8.3% per year over the projection period by product type. International and domestic flights are expected to increase as economic development continues, increasing business and tourist travel. Jet fuel demand is expected to reach 1,161 ktoe by 2040 (Figure 1.11).

Figure 0.11. Oil Demand, by Product Type, BAU, 2018–2040



Ktoe = kiloton of oil equivalent, LPG = liquefied petroleum gas.
 Source: Kimura and Han (eds.) (2021).

Diesel demand will be growing slower than jet fuel at an average 5.5% per year. However, diesel is forecast to have the highest share in total oil demand (53%) in 2040. Most diesel demand will come from the road transport sector (82%). The remaining share will be from the industry, commercial, and power sectors. Diesel demand is projected to reach 4,437 ktoe by 2040.

The share of gasoline in total oil demand is forecast at around 23% in 2040, consumed only in the road transport sector. Gasoline demand will increase as the economy improves and income increases. As a result, the average growth rate of gasoline demand will be 5.1% per year, reaching 1,893 ktoe by 2040.

LPG demand will be growing at an average rate of 3.8% per year over the projection period. More houses are expected to use LPG for cooking as a substitute for biomass, especially in urban areas. Similarly, the commercial and road transport sectors' use of LPG is also expected to increase. LPG consumption of the transport sector includes car and three-wheel tuk-tuks.

LPG demand is forecast to reach 732 ktoe by 2040. The commercial sector will have the highest share (53%) in the country's total LPG demand of 2040. The remaining share will be from the transport (28%) and the residential sectors (19%).

References

- Kimura, S. and P. Han (eds.) (2021), *Energy Outlook and Energy Saving Potential in East Asia 2020*. Jakarta: ERIA.
- Ministry of Mines and Energy Cambodia [MME] (2020), *Energy Demand and Supply of Cambodia 2010–2018*. Jakarta: ERIA.