



## LPG usage in Asia Pacific: A means or an end to meeting energy needs?

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This article is the first in a two-part series. The second part of the series will be released in the first quarter of 2020.

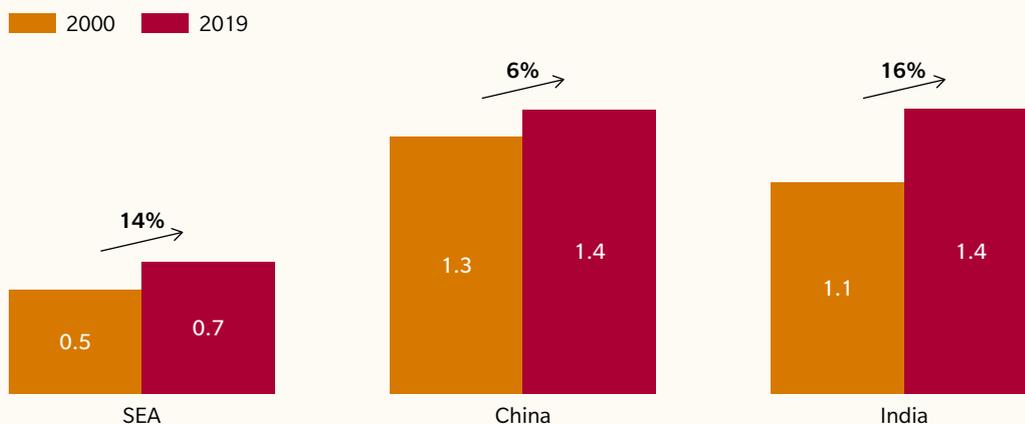
## Rising Energy Needs From a Growing Middle Class

Energy demand is growing in emerging markets because of rising populations, incomes, and levels of urbanisation. (See Exhibits 1 and 2.) This is especially true in large parts of Asia, where demand has grown for different fuels and for different uses of energy – notably electricity generation, residential heating and cooking, and transport and commercial applications.

Exhibit 1: Population and GDP per capita growth since 2000

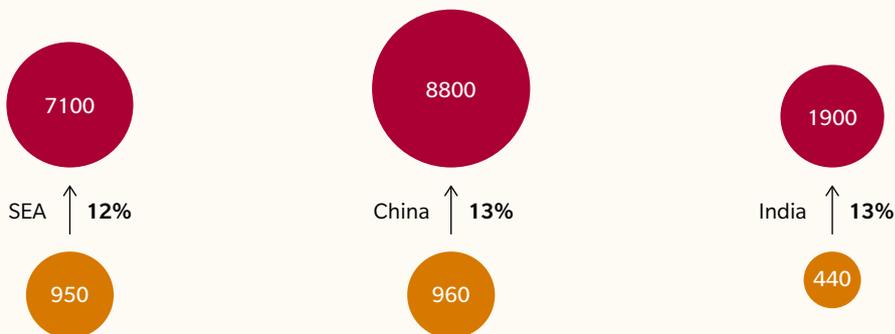
### Population of key Asian growth engines

2000 – 2019 (BN), Growth per decade (%)



### GDP per capita

2000 – 2018 (USD), CAGR (%)



Source: United Nations WPP, World Bank

Traditionally, the developing world has met its electricity and other energy needs predominantly through coal, supplemented by natural gas. Now, developing economies are looking for other sources. These include distributed generation, such as microgenerators, and renewables, where the success of the latter depends on the availability of storage and a reduction in generation intermittency. However, a number of factors have driven authorities and suppliers towards alternative forms of energy that are affordable, clean, and relatively easy to distribute. That often means compressed natural gas (CNG) or liquified petroleum gas (LPG).

One reason is that the development programmes led by both national governments and international organisations have begun to focus on other targets in addition to that of combating energy poverty.<sup>1</sup> These include reducing carbon intensity, improving air quality, and combating climate change. Ways to achieve these goals include the use of fuels for household cooking and industry that pollute less and are less carbon-intensive – for example, by replacing firewood or kerosene with LPG.

A second cause of the shift to LPG is its practicality: LPG is relatively low-cost and easy to transport and carry. By contrast, the supply of traditional fuel sources is dwindling. Increasingly unpredictable monsoons are limiting the use of firewood in Asia, while alternatives such as coal and natural gas have high infrastructure requirements. They need high capital investment; construction lead times are long; land needs to be acquired; and it is challenging to deliver the energy to populations spread out over expansive land masses. As a result, many governments prefer LPG as an immediate solution.

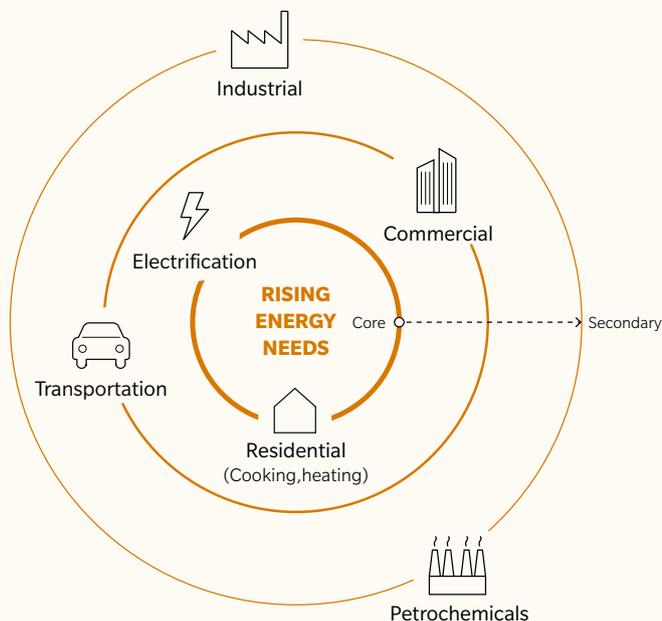
Thirdly, governments are trying to balance their budgets. Countries such as India, Indonesia, and Thailand subsidise some fuels, such as kerosene and gasoline, which are also a cause of pollution. So the governments have been encouraging a shift towards sources such as LPG and CNG, which are subsidised less or not at all.

All these factors naturally drive authorities and suppliers towards affordable, cleaner and distributable alternatives of energy, such as LPG or small-scale renewables.

1 Source: United Nation Sustainable Development Goals; IEA, Energy Access Outlook, 2017, From Poverty to Prosperity; UNESCO Institute for Statistics

Exhibit 2: Key demand drivers contributing to rising energy needs<sup>2</sup>

**Key drivers of demand**



## The Generation Of LPG Growth

Besides forays into distributed generation e.g. micro-generators as well as renewables, many emerging markets have turned to energy sources which are both “portable” and cost efficient – for instance, bottled gas i.e. LPG and CNG. These are increasingly imported to supplement declining or non-existent domestic gas production in the face of increasing residential, transport and industrial demand growth.

There are two main factors driving the growth in LPG. In countries such as India, Vietnam, China, and Thailand, national or state authorities drive the preference and adoption of one fuel type over another. Governments use a mix of incentives, start-up subsidies, and distribution licenses to generate momentum and create network effects, especially in the transport sector. As a result, the North and Eastern coastal regions of India and China typically have relatively high LPG penetration. Inland areas, however, rely more on piped natural gas for residential uses and CNG for transport and industrial use, which do not require pipelines.

<sup>2</sup> LPG and LNG also used in industrial and petrochemical processes as base materials, feedstock and treating agents for chemicals, fertilisers, plastics, anti-freeze, not necessarily utilised as an energy form in the traditional (combustion) sense.

In contrast, private players have catalysed LPG usage in countries such as Bangladesh, Vietnam, and Sri Lanka, by offering the right combinations of affordability and convenience. In the case of LPG, the final product is easily dispatched in smaller 3, 5, 12 kg canisters (“break bulk”) for residential customers and can go up to 40 kg for industrial sizes, bringing both mobility and affordability to less wealthy customers in non-urban regions. These configurations differ across international and intranational regions, in order to meet the economic means of buyers, and in a format easily delivered to the “last mile” via trucks or bikes, across less friendly terrain.

## **LPG to plug the gap?**

LPG was previously seen in the developed world as a niche by-product. To become a major alternative source of energy, it first had to become widely available through the following forms of production.

The conventional and most common form of production is via fractional distillation, or oil refining. LPG is also increasingly produced by processing natural gas, as major natural-gas producing countries ramp up their production and export of natural gas in order to participate in an increasingly liquid spot market.

A third method of production, more predominant in countries with large petrochemical facilities, is the splitting process. Condensate (light crude oil) is split into naphtha and LPG, both of which can be used as feedstock to produce light plastics. The petrochemical facilities optimise the mix of naphtha and LPG for use as feedstock, and the excess LPG is then typically used as residential or industrial energy in these countries. This type of production has been associated with the growth of Russian and Iranian condensate exports.<sup>3</sup>

Another boost for the availability of LPG has come from rising production of shale gas and natural gas liquids (NGL) in the United States, Russia and the Middle East. In addition, transport by canister has helped to deliver LPG in emerging countries where demand is spread out and the inland distribution infrastructure is limited.

3 US sanctions were relaxed after Dec 2015 driving up condensate exports from ~1.2 mbd in 2015 to a peak of 2.7 mbd in Jun 2018. However, sanctions were re-imposed in May 2018 driving down condensate exports to 1.9 mbd in Sep 2018 – leading to volatile shifts in condensate exports, and therefore splitter utilization and LPG production levels. Source: <https://www.eia.gov/todayinenergy/detail.php?id=37352>

## Different Customer Archetypes

LPG is versatile and can be deployed in several different applications. Residential consumers use it for heating and cooking because of its high calorific value. However, there are also other non-residential uses, such as transportation and commercial and industrial heating, as well as non-energy uses including petrochemical feedstock (See Exhibit 3).

Exhibit 3: Main uses of LPG (by segments)

**Population of key Asian growth engines**  
2000 – 2019 (BN), Growth per decade (%)

Segments	Typical mode of transport	Typical product size	Commentary
Residential	<ul style="list-style-type: none"> <li>Barges / trucks (canister)</li> <li>Motorcycles (last mile delivery)</li> </ul>	<ul style="list-style-type: none"> <li>3 – 5 kg (residential)</li> <li>12 kg (residential)</li> <li>20 – 25kg (shophouses, mixed use)</li> </ul>	<ul style="list-style-type: none"> <li>Product size differs based on affordability and usage behaviour</li> <li>Distribution via smaller canisters more prevalent in rural regions; self pick up (by motorcycle) available</li> </ul>
Residential	<ul style="list-style-type: none"> <li>Rail / trucks (canister)</li> </ul>	<ul style="list-style-type: none"> <li>12 – 25 kg</li> <li>48 kg</li> </ul>	<ul style="list-style-type: none"> <li>12 – 25 kg canisters for shophouses, restaurants (cooking, heating)</li> <li>48 kg canisters typically for hotels, commercial buildings</li> <li>Some self pick ups</li> </ul>
Industrial	<ul style="list-style-type: none"> <li>Trucks (canister)</li> <li>Trucks (tankers)</li> </ul>	<ul style="list-style-type: none"> <li>48 kg</li> <li>Direct delivery into tank</li> </ul>	<ul style="list-style-type: none"> <li>Usage a mix of industrial applications as well as energy and feedstock usage (manufacturing, fertilizers, chemicals)</li> <li>Mostly delivered by supplier, to customer site</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>Trucks (tankers)</li> </ul>	<ul style="list-style-type: none"> <li>Variable (dependent on car/truck)</li> </ul>	<ul style="list-style-type: none"> <li>Various uses have surfaced e.g. small boats, trucks, cars</li> <li>Largely dependent on network effect and economics vis-à-vis alternatives (and thus government policy)</li> </ul>

Source: OW industry expertise

In many cases, government and regulatory forces are the main drivers of the shift away from energy sources such as firewood, coal, and kerosene and towards LPG. As we have seen from Exhibit 3, LPG as a commodity is versatile and can be deployed for different applications. What is noteworthy is that its predominant application differs across parts of Asia, and is highly dependent on each region's differentiated mix of economic development, purchasing power, industrial economy as well as general accessibility to LPG.

Exhibit 4: Different LPG consumption behaviour across Asia

**Different national consumption archetypes across Asia Pacific**

	<b>Nascent</b> South & South East Asia	<b>Developing</b> South & South East Asia	<b>Emerging hub</b> China	<b>Sophisticated</b> North East Asia
<b>Examples</b>				
<b>Main uses</b>				
<b>Summary of market</b>	<ul style="list-style-type: none"> <li>Nascent demand with low consumption (&lt;20 kg / capita)</li> <li>Demand is largely residential, but with potential of exponential growth as economies industrialise</li> </ul>	<ul style="list-style-type: none"> <li>Developing economies with increased LPG demand for domestic, auto and commercial usage – driven by regulatory concerns over energy security</li> </ul>	<ul style="list-style-type: none"> <li>LPG+ penetration higher along coast - for domestic and nascent petchem use</li> <li>Petchem demand mostly PDH plants and capacity expected to grow significantly</li> </ul>	<ul style="list-style-type: none"> <li>Largely imported by retail and petchem players – transport declining (except for Korea)</li> <li>Common use of petchem feedstock switching for optimization</li> </ul>
<b>Players &amp; competitive dynamics</b>	<ul style="list-style-type: none"> <li>Typically small / mid sized local importers without VLGC capabilities</li> <li>In-country distribution typically challenging, with huge cost differences between coast versus in-land (due to transportation cost)</li> </ul>	<ul style="list-style-type: none"> <li>Increasingly the battleground between local and foreign players – typically CP pricing given Middle Eastern sources</li> <li>Waterborne infrastructure also requires capabilities across multiple logistic formats</li> </ul>	<ul style="list-style-type: none"> <li>Dominated by SOEs, with specialist importers in coastal cities importing LPG via intermediaries and increasingly direct from USGC (e.g. Enterprise)</li> <li>Largely CP pricing given ME origin (and US trade war)</li> </ul>	<ul style="list-style-type: none"> <li>Increasingly sophisticated players looking to expand regionally given declining domestic demand</li> <li>Use of domestic shorts to procure LPG from US / ME for regional distribution</li> </ul>

 Residential  Commercial  Petchem  Transport

Source: OW industry expertise

In the emerging economies of South and Southeast Asia, LPG is increasingly popular for residential use as a cleaner cooking fuel. This is especially the case in Indonesia, India, and Sri Lanka, where it is subsidised.

In contrast, the developed economies of North Asia – that is, South Korea, Japan, and Taiwan – have been industrialised since the 1960s, and they have built up natural gas pipeline infrastructures both for residential heating and for electricity generation. In these countries, LPG is predominantly used as feedstock for petrochemical (olefins) production and as transportation fuel. However, faced with declining domestic demand or margins, leading national importers in these countries have been declaring regional ambitions to expand supply into proximal markets. These include China and nascent economies such as Bangladesh, Sri Lanka, Cambodia, and Myanmar. (See Exhibit 4.)

Demand in China comes from all four sectors but is especially pronounced in residential and petrochemical applications along the coast. Of particular note, is China's use of LPG in feedstock for propane dehydrogenation (PDH) units. The US-China trade war has had an impact on flows of LPG into China but has not significantly reduced Chinese demand for it. Chinese importers have been increasingly seeking African and Middle East sources, and in parallel, also diverting previously Chinese-bound supply into India, Indonesia as well as Latin America, and driving up global demand for LPG.

The next instalment of this series will look at the underlying factors driving LPG demand in different countries and sectors. It will also ask whether LPG is likely to be a transitory energy source or to become a permanent fixture in the Asia-Pacific region.

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