

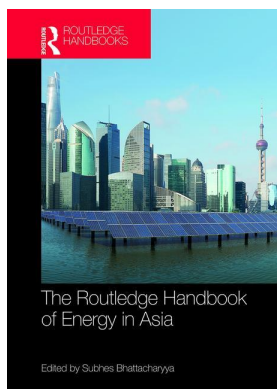
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7

RESIDENTIAL ENERGY USE IN ASIA

Subhes C. Bhattacharyya

Regional overview

Residential energy demand is a major final energy consuming sector in many Asian countries.¹ As indicated in Chapter 2, this sector was the highest consumer of final energy in 1990 but has been displaced to the second place by industry, particularly due to strong industrialisation efforts in East Asia. Unlike other sectors which are dominated by modern commercial energies, residential energy demand in Asia is greatly influenced by traditional biomass. As indicated in Chapter 4, Asia has the largest number of people in the world using biomass and traditional energies for cooking purposes. As a consequence, the demand evolution varies depending on whether these traditional energies are included or excluded from the analysis. Figure 7.1 indicates a modest growth in total residential energy demand (i.e. including biomass) – just 1.6% per year on average for the region between 1990 and 2012. This is almost half the growth rate of total final energy use in the region for the same period. The demand has grown from just below 600 Mtoe to just above 800 Mtoe during this period. However, the use of modern fuel is growing in the sector and its share increased from about 31% in 1990 to about 44% in 2012 (International Energy Agency, 2015). The effect of Asian financial crisis in 1997 is clearly visible in the figure.

East Asia and South Asia greatly contribute to shape the overall residential demand in the region. Taken together, they accounted for 85% of the demand in 1990 with East Asia contributing almost 58% of the demand. The situation has improved marginally over the period as the overall share of these two sub-regions had fallen to 82.5% by 2012, with South Asia accounting for about 30% of the demand. West Asia has the lowest share (about 3% in 2012) in residential energy demand of the region whereas the remaining share comes from South East Asia (13.5% in 2012).

However, the picture changes quite significantly when the biomass energy is excluded. East Asia remains the dominant player but its share changed to 79% in 1990 and 68% in 2012 (see Figure 7.2). South Asia's share reduced to 12% in 1990 and 16% in 2012. South East Asia accounted for 6% and 8% respectively in 1990 and 2012. The rest mainly came from West Asia. The figure suggests an accelerated growth in demand in the new millennium, recording a growth rate of almost 4% per year between 2000 and 2012. The penetration of modern energy in the sector varies by country and sub-region. Dependence on biomass is practically non-

Residential energy use in Asia

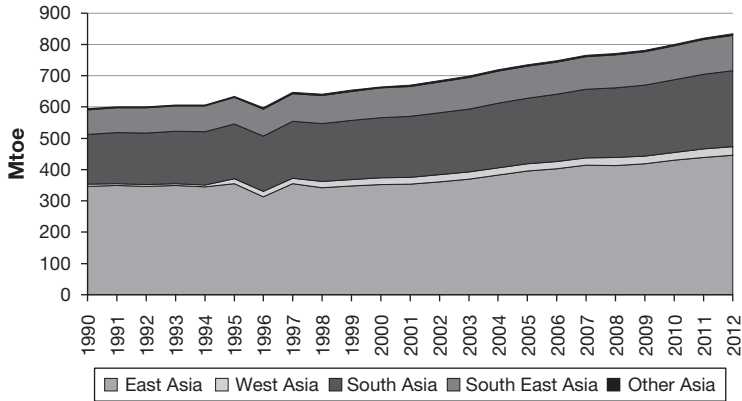


Figure 7.1 Evolution of total residential energy demand in Asia

Data source: International Energy Agency (2015).

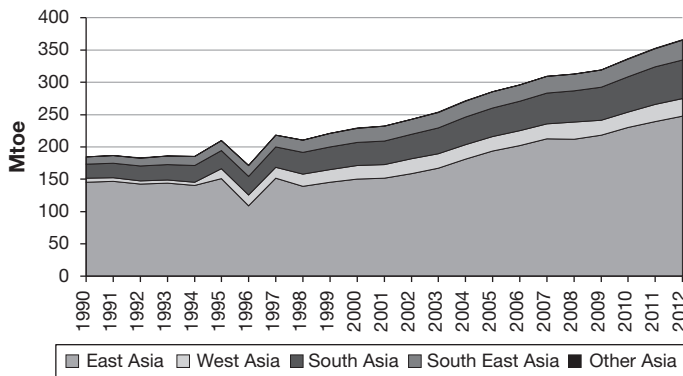


Figure 7.2 Trend of modern energy demand in the residential sector in Asia

Data source: International Energy Agency (2015).

existent in developed countries of the region (Japan, Singapore, South Korea) or in West Asian countries.

As population increased from three billion in 1990 to almost four billion by 2012 (UN DESA, 2015), the household energy consumption per person did not record any significant change. In 1990, the average consumption per person was 197 kgoe. This changed to 210 kgoe in 2012. However, there is a significant regional variation: West Asia has the highest level of consumption (close to 350 kgoe/person), followed by East Asia (above 250 kgoe/person), whereas south Asia has about 150 kgoe/person in 2012 (see Figure 7.3).

The energy mix of households has changed over this period of study. The biomass share reduced from 69% in 1990 to 58% in 2012. Coal has also lost its share from almost 16% in 1990 to 7% in 2012. Electricity share has gained rapidly: from 4.9% in 1990 to 16% in 2012. Natural gas has also recorded a significant gain in market share: from 2.7% in 1990 to almost 9% in 2012 (see Figure 7.4).

However, there is a significant regional variation in terms of energy mix (see Figure 7.5). As indicated earlier, West Asia has the lowest level of biomass dependence whereas South and

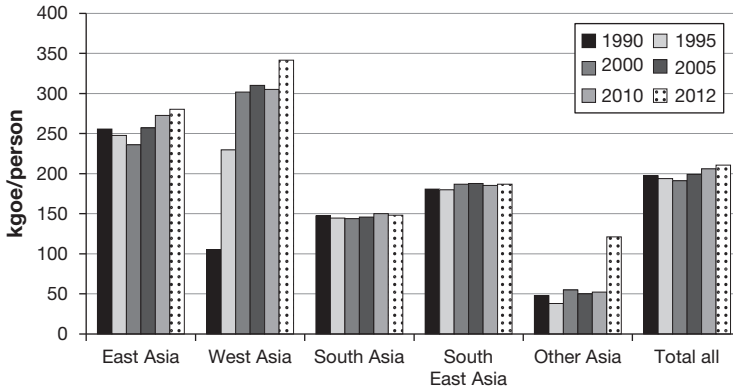


Figure 7.3 Household energy use per person in Asia (kgoe/person)

Data source: International Energy Agency (2015) and UN DESA (2015).

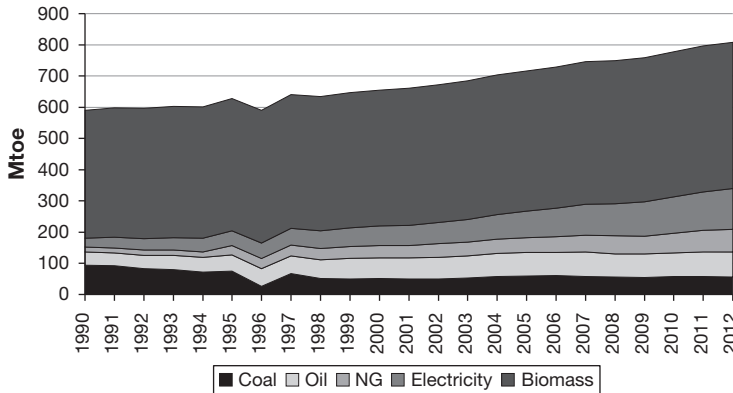


Figure 7.4 Fuel mix in the residential sector in Asia

Data source: International Energy Agency (2015).

South East Asia are still dependent on biomass for energy use. Natural gas has penetrated widely in West Asia and has secured its foothold in East Asia by 2012. The share of electricity, on the other hand, has grown in all regions – showing preference for convenient form of energy at the household level.

Sub-regional pattern of residential energy use

Given the heterogeneity of regional demand pattern at the household level, a closer look at each sub-region is appropriate.

Residential energy use in East Asia

Residential energy use in East Asia increased from 346 Mtoe in 1990 to 446 Mtoe in 2012, recording a modest growth on 1.1% per year. Out of this, about 200 ktoe of biomass was used, most of which was in China. The biomass use remained almost unchanged, thereby registering

Residential energy use in Asia

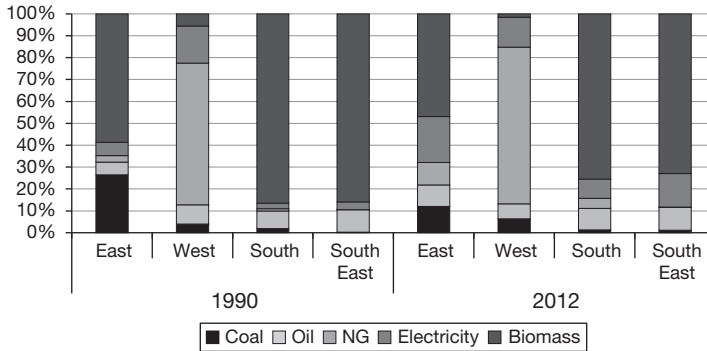


Figure 7.5 Regional variation in household energy mix

Data source: International Energy Agency (2015).

a decline in its share in the energy mix over this period. China's biomass dependence in the residential sector has fallen from 69% in 1990 to 53% in 2012. The growth in residential energy demand has been met by modern energies and the consumption has increased from 145 Mtoe in 1990 to 247 Mtoe in 2012, recording an average annual growth of 2.45%. Three countries, China, Japan and South Korea contributed more than 96% of the modern energy use in the sector of this region and are considered below.

The fuel mix in the region has evolved over time: coal use in the sector has declined from almost 91 Mtoe in 1990 to about 51 Mtoe in 2012. China and South Korea were the major coal users in 1980 but coal has been almost phased out in residential use in South Korea by late 1990s as natural gas started to penetrate the market. Coal is still used in the residential sector in China but is largely confined to rural areas. On the other hand, consumption of oil products, natural gas and electricity has increased manifold: consumption of electricity and natural gas grew four times while that of oil products doubled (see Figure 7.6). However, the demand growth has been much faster in China compared to other countries. As a result, whereas Japan dominated the modern energy use in the region in this sector in 1990s, China has taken over the position in the last decade with a contribution of almost 60%. Japan still accounts for 20 to 30% of the sub-regional demand in the sector, with higher end ratios for oil and electricity and the lower end for natural gas.

Figure 7.6 also indicates high share of electricity in residential energy demand in all countries. Households, particularly urban households are benefitting from the convenience of electrical appliances. As the appliance stock improves, the share of electricity in the energy mix improves as well.

Despite growing residential energy use in China, its energy consumption per person is still low compared to Japan and South Korea. While Japan is showing a minor reduction in per capita consumption, it comes second to South Korea now, where on average 400 kgoe are being used per person. China, on the other hand, consumes almost a third of South Korean average household consumption (about 127 kgoe/person) (see Figure 7.7).

There is also significant urban–rural variation in residential energy use. According to Zheng et al. (2014), while urban residents live in smaller dwellings (96 m² compared to 135 m²), they consume more energy (651 kgce/person compared to 445 kgce/person in rural areas). The fuel mix is also different: fuelwood still dominates the energy mix of rural areas whereas district heating accounts for 56% of energy used in urban households. Natural gas is almost non-existent in rural areas but 20% of urban residential energy comes from natural gas. The share of electricity

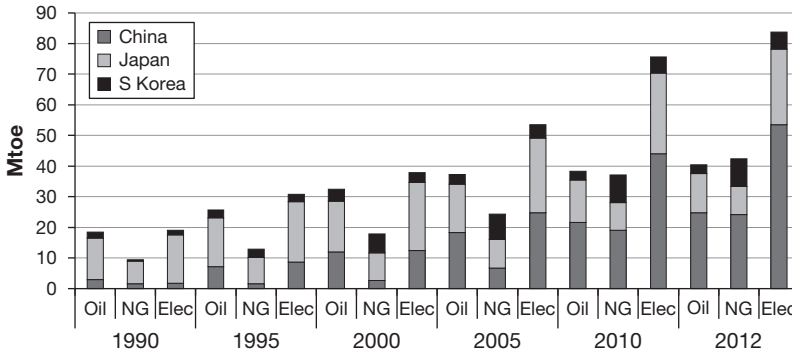


Figure 7.6 Evolution of modern energy use in the residential sector in East Asia

Data source: International Energy Agency (2015).

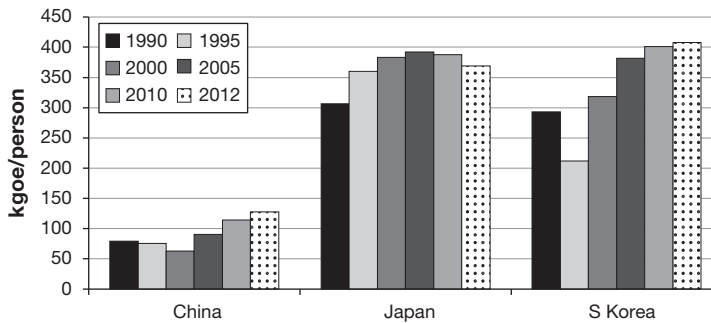


Figure 7.7 Comparison of residential energy use per capita (excluding biomass)

Data source: International Energy Agency (2015).

consumption in two areas is quite similar (about 15%) however. Space heating is the most energy consuming activity in urban areas whereas cooking consumes most energy in rural China.

However, China is urbanising rapidly: from 19% in 1980, the share of urban population increased to 56% in 2015 and by 2050, 77% of China’s population will live in urban areas according to the United Nations (2014). Urbanisation has direct implications for residential energy use. The higher energy use per person in an urban household will exert pressure on energy demand and higher reliance on modern energies will reduce China’s dependence on fuelwood. But high fossil fuel dependence will increase the carbon footprint, which suggests the importance of improving energy efficiency of appliances and building stocks. Urbanisation can facilitate improvements in energy usage efficiency due to higher concentration of users (Fan et al., 2017).

Gradual decline in residential energy use per person in Japan can be attributed to its population decline and intensification of efforts to improve energy efficiency. The Top Runner Programme, introduced in 1998, has set the energy efficiency targets for equipment and machinery and covers 70% of the household energy consumption (International Energy Agency, 2016). In addition, Japan has a relatively new building stock: 75% of its buildings are built after 1980 and only 2% of the buildings were built before 1950s (International Energy Agency, 2016). A high demolition rate and new building stock has helped Japan to achieve higher energy efficiency in buildings. Through these efforts Japan has managed to restrain its residential energy demand over time.

Increase in per capita residential energy use in South Korea, on the other hand, is driven by growing per capita income, rising appliance ownership and growth in household numbers. Between 1990 and 2012, per capita income (in constant 2005 \$) increased from 8500 \$/capita to \$23,500 per person. The number of households in the country has also increased: in 1990, 11.1 million households lived in the country but by 2015, the number had increased to 19.5 million.² The housing availability also increased during the same period: from 7.4 million units in 1990 to 16.4 million in 2015. Rising income and household number also leads to a higher appliance stock. A recent study (Yoo & Kim, 2014) found that electrical appliances (such as fridge, TV, rice cooker, radiators, computers, washing machines, vacuum cleaners, etc.) largely contribute towards electricity consumption in households. The amount of electricity used increases as the family size increases but electricity consumption per person is higher for one-member families compared to a four-member family. The share of one-member household has increased over time and in 2015 represents the most common type of households in the country. With an aging population, it is likely that the share of one-member households will increase further in the future.

West Asia

West Asia has seen a four-fold increase in residential energy use between 1990 and 2012 and as indicated in Figure 7.3, the sub-region has the highest per capita residential energy use in Asia. This region also has the lowest share of traditional energies in the residential fuel mix (just about 1%). The region also shows a dramatic change in energy use pattern in the 1990s when the countries became independent states subsequent to the collapse of the former Soviet Union. There is data uncertainty during the early period of 1990; accordingly the trend from 1995 is presented (see Figure 7.8). Natural gas dominates the residential energy mix in the region – with a 65% share in the fuel mix in 2012. Electricity and heat supplies constitute the other two major energy sources, while others (coal, oil and biomass) supply the balance. The effect of economic crisis of 2008 is also clearly visible on the residential energy use when the demand fell sharply but the turnaround was quick and the sector has returned to growth path again in 2011.

Three countries, namely Uzbekistan, Azerbaijan and Kazakhstan, dominate the regional scene of this sector, with Uzbekistan occupying a prominent place. 78% of natural gas consumption in the residential sector of this region originates from Uzbekistan. In fact, Uzbekistan meets the majority of its energy needs through natural gas. Likewise, Azerbaijan is also greatly dependent

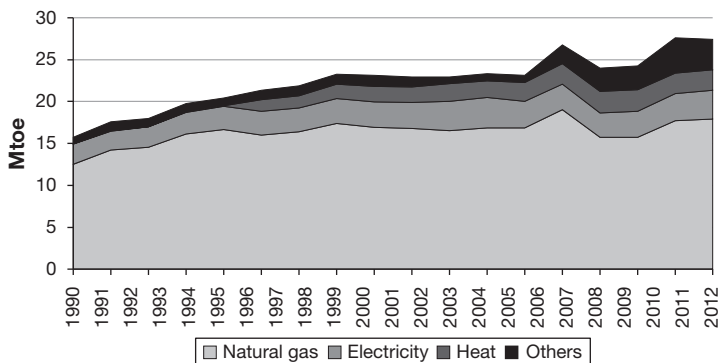


Figure 7.8 Evolution of residential energy demand in West Asia

Data source: International Energy Agency (2015).

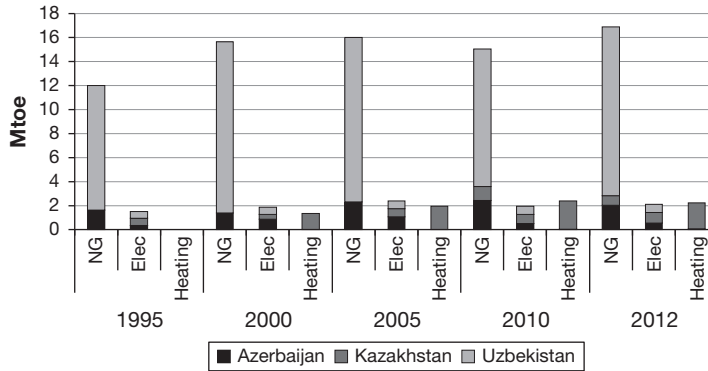


Figure 7.9 Comparison of residential energy mix in three dominant West Asian countries

Data source: International Energy Agency (2015).

Table 7.1 Per capita residential energy use (excluding biomass), kgoe/person

	2000	2005	2010	2012
Azerbaijan	280.05	405.52	333.32	286.22
Kazakhstan	133.91	184.33	379.62	411.43
Uzbekistan	610.33	551.80	433.82	520.28

Data source: International Energy Agency (2015) and UN DESA (2015).

(80%) on natural gas for its residential energy needs. Kazakhstan, on the other hand, relies on a mix of fuels (coal, oil, natural gas, heat, and electricity), with district heating emerging as a major source of residential energy in recent times. The district heating system is very common in Kazakhstan that supplies steam, hot water and space heating to industrial, residential and commercial users (OECD–EAP Task Force, 2012).

Figure 7.9 presents the main residential energy use in three dominant countries of the region. Uzbekistan overshadows the other two very clearly in this figure. The consumption pattern is also relatively stable, with minor variation over the period. Notice also the reduction in electricity demand in the sector in Azerbaijan after 2005. This is attributed to an increase in electricity tariffs in the country (Energy Charter Secretariat, 2012).

The residential energy use per person varies quite significantly across these countries (see Table 7.1). Uzbekistan has the highest level of residential energy use per capita whereas Azerbaijan had the lowest in 2012. However, energy use per person in Kazakhstan has trebled between 2000 and 2012, thereby changing the order. The residential energy demand in Kazakhstan grew at 10% annually between 2000 and 2012, whereas electricity demand grew at 15% per year. This is driven by economic growth fuelled by oil and gas export revenue, which has resulted in a trebling of household income in the country (Kerimray et al., 2017). Consequently, the living space has expanded and appliance holding has increased, leading to higher energy demand.

A study (Kenisarin & Kenisarina, 2007) reported that the residential sector in Uzbekistan uses natural gas inefficiently for its heating needs due to poor metering, inappropriate tariff, poor

insulation and inadequate regulatory requirements to save energy. The study suggested that almost 50% of the gas consumption could be reduced through a targeted programme. Similarly, specific heat consumption in Kazakh houses is reported to be very high (273 kWh/m²) compared to European countries (e.g. 130 kWh/m² in England) (OECD–EAP Task Force, 2012). Residential consumption of heat is not metered and users pay for heat based on established norms. It is reported that the tariff does not reflect the true cost of energy use and does not provide any incentive to save energy. The district heating network is also outdated and is a source of heat loss (OECD–EAP Task Force, 2012).

Because of high dependence on fossil fuels and high per capita energy use, the residential sector of the region contributes significantly to carbon emissions. As the population of the region is likely to grow by 26% between 2015 and 2050 (UN DESA, 2015), continuing with the present trends will have significant implications for the future carbon emissions. However, all countries in the region are actively considering energy saving options through renovation, technological upgrading and better regulation.

South Asia

The residential energy use in South Asia has increased by 50% between 1990 and 2012, recording an annual average growth rate of 1.9%. However, as biomass and traditional energies play a dominant role in the region and their size grew only 33% over this period, the modern energies recorded a faster growth in the region. Electricity use has recorded the fastest growth while coal use has gone out of fashion (see Figure 7.10). Natural gas is also gaining consumer support. In 2012, 75% of residential energy needs were satisfied by biomass and traditional energies, 10% by oil products, 9% by electricity, 5% by natural gas and 1% by coal.

The region remains highly dependent on biomass resources for its residential energy use (see Table 7.2). Although the dependence is declining, this is happening at a slow pace. Most of the countries rely on biomass for cooking and heating purposes, particularly in rural areas. Lack of affordable alternatives and lesser attention to cooking energy solutions are responsible for such a widespread reliance on traditional resources.

South Asian residential energy demand is highly influenced by India and Pakistan. Both of them accounted for almost 90% of the region’s residential energy use in 2012. If Bangladesh is

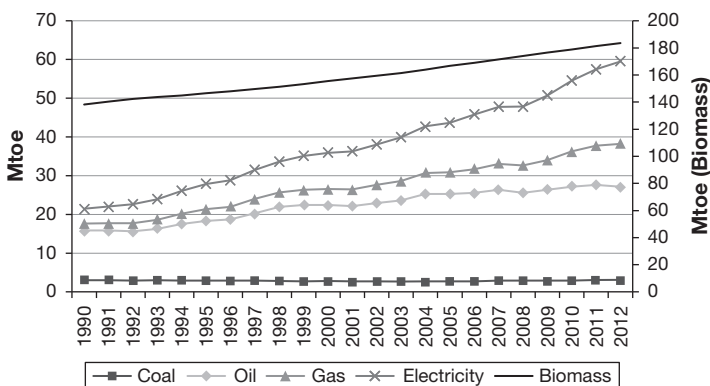


Figure 7.10 Evolution of residential energy demand in South Asia

Data source: International Energy Agency (2015).

Table 7.2 Biomass dependence in South Asia for residential energy needs (%)

	1990	1995	2000	2005	2010	2012
Bangladesh	0.89	0.86	0.81	0.76	0.72	0.70
India	0.86	0.84	0.81	0.79	0.76	0.75
Nepal	0.98	0.97	0.96	0.96	0.97	0.97
Sri Lanka	0.97	0.95	0.93	0.91	0.88	0.88
Pakistan	0.82	0.80	0.78	0.77	0.74	0.72

Data source: International Energy Agency (2015).

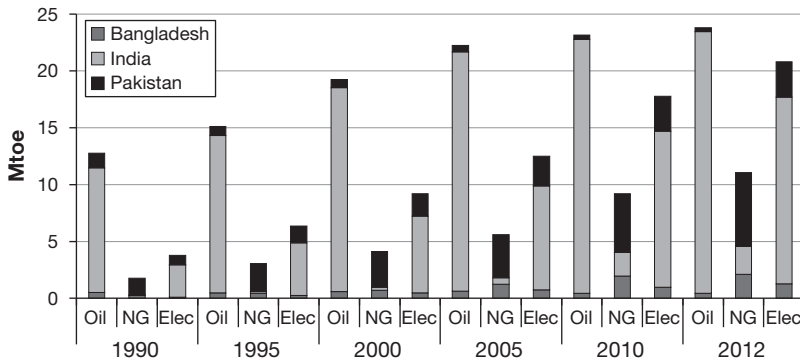


Figure 7.11 Evolution in commercial energy mix in major South Asian countries

Data source: International Energy Agency (2015).

included, the share increases to 95%. A focus on these three countries helps understand the regional picture. The evolution in the demand for major commercial energies is shown in Figure 7.11.

Oil products dominated the residential energy use in the 1990s but things have started to change in the new millennium when electricity has recorded a spectacular growth, particularly in India. As a result, in 2012, the gap between electricity and oil use has closed to a great extent. Natural gas demand has also grown substantially, particularly in Pakistan. The main petroleum products used by households are kerosene and LPG (liquefied petroleum gas). Kerosene is predominantly used in rural households whereas LPG is widely used by urban dwellers. As natural gas supply is contingent on the availability of distribution network, it is available in areas where the infrastructure exists or has been created.

South Asia remains the lowest residential energy user in Asia on a per capita basis. As Table 7.3 indicates the modern energy use per person remains modest. Pakistan leads the table with 56 kgoe per person per year, whereas on average households in Bangladesh use 24 kgoe per year. Population growth is one of the factors contributing to low energy use: between 1990 and 2012, more than 540 million people were added in these three countries.

India, being the most populous and largest country in this region, has contributed significantly to energy demand growth. Modern energy use in the sector has increased from about 17 Mtoe in 1990 to about 45 Mtoe in 2012, although traditional energies still support 75% of the overall energy needs of the sector. Oil products (mainly kerosene) remain the most important fuel, followed by electricity. Coal and natural gas account for the rest.

Table 7.3 Per capita residential energy use in selected South Asian countries

Per capita (kgoe)	1990	1995	2000	2005	2010	2012
Bangladesh	7.64	9.60	13.39	18.59	22.40	24.42
India	20.18	23.35	27.34	30.31	35.48	35.87
Pakistan	32.70	37.85	41.55	45.44	49.67	56.04

Data source: International Energy Agency (2015) and UN DESA (2015).

India's residential energy demand has been influenced by a number of factors. Being the second most populous country in the world and having a quite young population, demography influences India's residential energy demand significantly. Between 1990 and 2012, India added 428 million people, more than double the Brazilian population or almost equal to the population of Middle East and North Africa. Moreover, the composition of the population is changing: the size of the working age population was 710 million in 2010, which contributed to the growth in labour supply and in turn to growth in energy demand. Alongside, the country has also seen significant urbanisation, economic growth and the rise of the middle income class. In the past, India's traditional rate of economic growth was less than 4% per year but in the new millennium, an accelerated growth was realised (7% or higher). This has helped the country to pull 137 million out of poverty between 2005 and 2012 (Reserve Bank of India, 2013). In addition, although officially 31% of India's population lived in urban areas in 2015, a World Bank Study suggested that 55% of the population lived in urban and urban-like areas in 2010 (Ellis & Roberts, 2016). 53% of India's GDP in 2012 originated in urban and urban-like areas (Brar et al., 2014) and the per capita GDP of urban districts is four to five times higher than the rural districts. As a result of urbanisation and economic growth, a sizeable middle income class has emerged in the country: according to Goldman Sachs (2010), the size of the middle income class has increased from 50 million households in 2002 to 100 million in 2010.

These changes have positively influenced residential energy demand. For example, based on National Sample Survey Office (2012) data for Indian households, there is a significant difference in energy use between urban and rural India (see Figures 7.12a and 7.12b).

While both urban and rural households use a combination of fuels, the rural households tend to rely more on traditional energies whereas urban households use modern energies to a greater degree. Moreover, the appliance stock changes dramatically with urbanisation. Rural households hardly use white goods such as refrigerators, air conditioners or washing machines but they are common in urban areas. Thus, urbanisation has shifted the pressure on traditional fuels to modern fuels and the energy use intensity has increased as well. This trend will continue in the future as the country becomes more urbanised (see Bhattacharyya (2015) for a more detailed analysis of this issue).

South East Asia

The residential energy demand in this region has grown on average at 1.65% between 1990 and 2012. The fuel mix is highly dominated by biomass energy, accounting for 73% of the demand in 2012. Electricity accounted for 15% of the demand while oil products supported 10% of the demand. Coal and natural gas played a minor role in meeting the demand. Electricity demand has rapidly grown in the region – at 8.6% per year between 1990 and 2012 (see Figure 7.13). This is the fastest growing fuel in the region and as a result, electricity has established itself as the leader

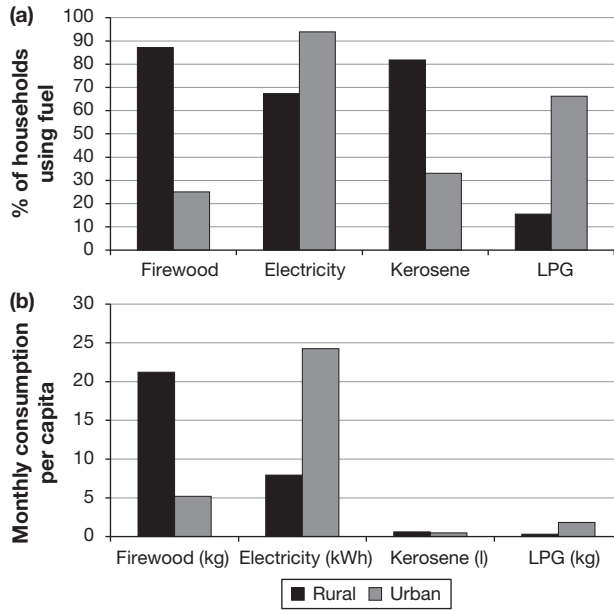


Figure 7.12 (a) Urban–rural divide in energy use (b) Difference in fuel mix in urban and rural areas

Data source: National Sample Survey Office (2012).

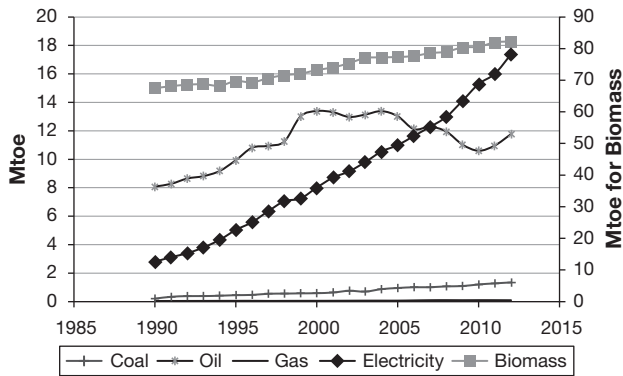


Figure 7.13 Trend of fuel demand in the residential sector of South East Asia

Data source: International Energy Agency (2015).

in commercial energy category. On the other hand, oil products have recorded a declining trend, particularly between 2000 and 2010. A rapid slow-down in demand in Indonesia due to political instability, economic troubles and reduction in the subsidies was responsible for this trend.

The residential sector of the region depends on biomass energy to a great extent, except in Brunei and Singapore. A declining trend can be seen in biomass dependence over time in Malaysia, Thailand and Philippines (see Table 7.4). Myanmar, Cambodia, Indonesia and Vietnam still rely on biomass for more than two-thirds of their residential energy needs.

Table 7.4 Biomass dependence in the residential sector of South East Asia

Country	1990	2000	2010	2012
Brunei	0	0	0	0
Cambodia	na	96%	92%	88%
Indonesia	83%	76%	80%	78%
Malaysia	59%	46%	39%	38%
Myanmar	99%	99%	98%	97%
Philippines	68%	69%	58%	57%
Singapore	0%	0%	0%	0%
Thailand	65%	66%	60%	53%
Vietnam	83%	84%	70%	68%

Data source: International Energy Agency (2015).

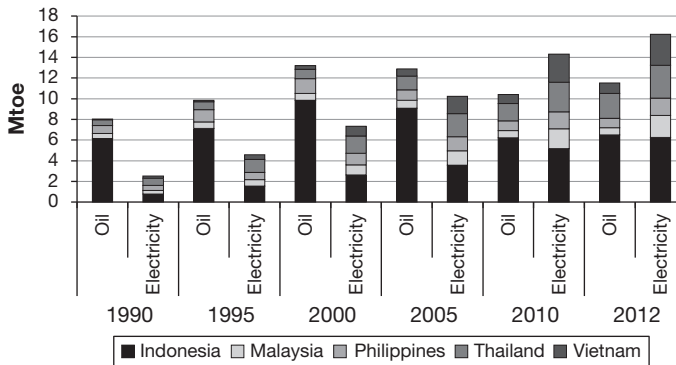


Figure 7.14 Changing fuel mix in the residential sector of South East Asia

Data source: International Energy Agency (2015).

In terms of modern energy use, while Indonesia dominates the energy scene of this region, four other countries, namely Vietnam, Thailand, Malaysia and the Philippines play an important role in the overall demand. The changing roles of oil and electricity can be clearly seen here (see Figure 7.14). Electricity has gradually taken over as the dominant modern residential fuel in the region. The region is urbanising rapidly – with more than 50% of the population living in urban areas by 2012. The preference for electricity in urban areas has driven the change. Moreover, IEA (2013) indicates the prevalence of widespread subsidy for petroleum products and electricity as a reason for demand growth (IEA, 2013).

The unit consumption (or per capita consumption) remains relatively low in the region (see Table 7.5). Vietnam has shown a spectacular growth (more than eight-fold increase between 1990 and 2012) in unit consumption in the residential sector. An average GDP growth of 7% between 1990 and 2012 and consequent three-fold increase in per capita income is the main reason. However, the income elasticity of demand appears to be much above one here, which may have happened due to the low starting point from where the demand is increasing in Vietnam. Thailand has also seen a four-fold increase in per capita modern energy use in this sector while in Malaysia the consumption per person has more than doubled during the same period. Indonesia and the Philippines, on the other hand, have recorded much lower

Table 7.5 Trend of modern energy use per person in the residential sector of South East Asia

<i>Per capita energy use (ktoe)</i>	1990	1995	2000	2005	2010	2012
Indonesia	38.72	44.67	60.59	57.54	47.77	51.42
Malaysia	45.86	59.62	70.46	83.85	92.94	98.00
Philippines	20.50	27.70	32.90	28.17	27.61	27.02
Thailand	22.15	34.23	41.71	55.05	68.78	82.63
Vietnam	7.30	14.41	24.37	40.48	55.39	59.61

Data source: International Energy Agency (2015) and UN DESA (2015).

growth in unit consumption. High population growth and modest economic growth can explain this trend.

Based on the sub-regional analysis, it is found that sub-regional features get submerged at the regional analysis and the overall pictures hide the inner differences. While the biomass use remains high in the region, particularly for cooking energy purposes, the use of modern energies is increasing fast. Electricity use is increasing at a fast rate – countries with high economic growth rate and high urbanisation rate are demanding more modern energy. Electricity is emerging as the preferred fuel in the residential sector. There is significant variation across the region in terms per capita energy use but countries are catching up the high consumption pattern and over time, modern energy demand will only increase.

Future outlook of residential energy use in Asia

The evolution of residential energy use depends on the main drivers of demand change and their interactions. As indicated before, demographic transition in the region has a significant influence. According to UN DESA (2015), Asia's population will increase by 530 million between 2015 and 2030 and another 344 million will be added between 2030 and 2050, making a total of 874 million additional people by 2050. Further, the working age population in most Asian countries will dominate the demography – thus the ratio of working to non-working population will still remain favourable, generating the population dividend. In addition, the size of urban population will increase: according to United Nations (2014), by 2050, 64% of Asian population will live in urban areas. As a result, the urban population will increase from 2.06 billion in 2014 to 3.31 billion in 2050. Moreover, urban agglomerations being centres of economic growth, a larger share of the economic output will come from urban areas and will fuel income growth as well. This will expand the size of the middle class in the region, who will have better buying power. This will be supported by the economic outlook for the region which remains promising and this will influence the residential energy use in the future. Further, the region is actively pursuing initiatives to improve the level of energy access, particularly in South and South East Asia. Improved access to sustainable energy is likely to reduce the dependence on biomass for cooking and the share of modern fuel use will increase in the region.

According to EIA (2016), China will experience an annual average increase of 2.4% in the residential energy demand between 2012 and 2040. But it projects a higher rate of demand growth (3.2% per year) for India and a slightly slower rate of 2.3% for other Asian countries. The total demand in developing Asia (excluding OECD Asia) reaches to 408 Mtoe in 2025 and increases to 580 Mtoe in 2040 (see Figure 7.15). Electricity becomes the most prominent fuel in

Residential energy use in Asia

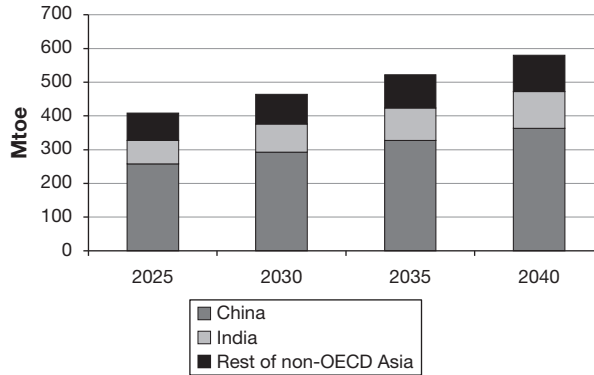


Figure 7.15 Residential energy outlook in developing Asia (reference scenario)

Data source: EIA (2016).

the residential sector of the region but oil products continue to be used. Natural gas use increases in China but in the rest of Asia its role remains limited. Clearly, China's domination in the sectoral energy use continues and India's share rises to match the rest of developing Asia. However, the traditional energy use has not been included in this outlook.

In their forecast for the region, the Asian Development Bank includes residential energy sector in other sectors and suggests an average growth of 2.5% for the period up to 2035 (ADB, 2013). China, India and South East Asia will contribute to the growth in energy demand. The projected growth rates are higher than the historical growth noted earlier. The rise in population, sustained economic growth and better affordability will contribute to the growth in residential energy use.

Conclusion

The residential sector in Asia is a major user of energy and its high dependence on biomass for cooking has remained an issue for most of the developing countries in the region. However, as economies develop, the preference for electricity as the versatile form of energy is becoming clear. Electricity demand has rapidly grown in the residential sector and the outlook suggests that this is likely to intensify in the future as the middle income class expands and the countries become more urbanised. However, as coal is the main fuel for electricity generation in the region, increased use of electricity adds to higher carbon emissions. The cooking energy will mainly shift towards liquid or gaseous petroleum fuels but it remains to be seen whether solid biomass is displaced in favour of modern, clean fuels. The regional demand is dominated by East Asia, followed by South Asia, and this pattern is likely to continue in the future. The region has significant potential for demand reduction through demand management and energy efficiency improvements. Appropriate pricing of energy holds the key but energy price rationalisation remains a politically sensitive issue in the region.

Notes

- 1 This chapter follows the same regional coverage as in Chapter 2 and the sub-regional composition indicated in that chapter remains applicable here as well.
- 2 KOSTAT, Complete Enumeration Results of the 2015 Population and Housing Survey, <http://kostat.go.kr/portal/eng/pressReleases/8/7/index.board>

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