

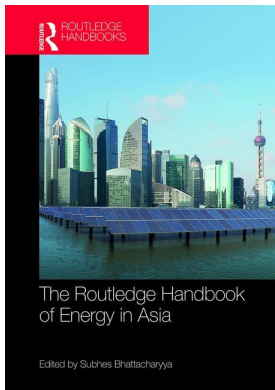
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Concluding remarks

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CONCLUDING REMARKS

Subhes C. Bhattacharyya

Summary of main conclusions

This Handbook, in four parts spread over 26 chapters, has considered various aspects of the Asian energy sector. The present century has been variously termed as the Asian Century and over the past 15 years, the region has made significant improvements economically, socially and of course energy-wise. Between 1990 and 2015, Asian economies grew faster than the world economy, thereby increasing the Asian share in the global economic output. As a result, most countries transited to the middle income category in purchasing power parity terms (2011 base) by 2015 and millions of people have come out of poverty. Asian economic development has transformed the economies through rapid industrialisation, unprecedented growth in urbanisation and the emergence of the middle income class. Simultaneously, the population has grown due to a relatively youthful population structure but now population growth is slowing down and the proportion of the older population is growing.

The economic and social transformation of the region has influenced its energy use tremendously. The region has emerged as a global leader in energy use, demanding more than 40% of global primary energy consumption. East Asia has dominated the energy demand in Asia in the past, accounting for more than 70% of the regional energy needs. However, going forward, South Asia and South East Asia will make significant contributions to the region's energy use as these economies grow, urbanise and take millions out of poverty. The region is highly dependent on its local coal resources, particularly for electricity generation and industrial energy needs. Coal use has dramatically increased over the past 15 years, bringing air pollution and other environmental concerns at the local level and contributing to climate change worries.

The region has emerged as a major player in the international oil market and regional natural gas market due to growing demand for these fuels in the transport sector and the power sector, respectively. Most of the incremental global demand for oil came from Asia in the past decade and the effect of growing demand was felt on international trade due to the limited local availability of oil. Major oil exporters are now competing to improve their Asian market share. Relatedly, the Asian national oil companies have emerged as important players, particularly in upstream asset acquisitions. However, the region lacks its own crude reference price and the region is likely to continue with its presence reliance on Price Reporting Agencies in the absence of any plausible

alternative options. In the case of natural gas, Liquefied Natural Gas has emerged as the preferred supply option due to long distances separating the sources from the demand centres. The demand for gas is expected to grow in the future, which in turn will require significant investment in developing the required infrastructure.

Industry is the main user of energy in Asia which is unlike many other regions where residential and commercial sectors tend to dominate. Rapid industrial growth in China was responsible for a high share of industry in China's final energy use but in other countries and sub-regions, industry played an important role in energy demand. Although countries have taken steps to improve energy efficiency in the sector, there is significant variation in industrial energy intensity and the overall regional gross domestic product (GDP) elasticity of industrial demand remains high. There is the potential for experience sharing and learning from one another, particularly because Japan is the leader in energy efficiency and offers a role model for others in the region. Since 2012, China has been slowly adjusting to its new normal economic condition where the economy is expected to grow at a slower rate. Chinese energy demand as a result is likely to grow slowly compared to the speed of growth in the past 15 years or so. This also offers a window of opportunity to reduce dependency on coal and to promote renewable energies.

The residential sector is the second major user of energy in Asia, after the industrial sector. Although modern energy use is growing and the preference for electricity is clearly visible, the region still depends on traditional energies to a great extent. The growing trend of urbanisation and the emergence of the middle income class is changing the residential energy use in Asia and as economies become better off, the demand for energy intensive appliances (such as air-conditioners, washing machines, dishwashers, etc.) will rise. This is expected to result in a higher growth of residential energy demand compared to the historical rates. However, there are significant opportunities for demand management through efficient energy pricing and energy efficiency programmes.

The transport sector is the third major user of energy and the demand has grown several fold between 1980 and 2013. Population growth in the region and income growth over time have contributed significantly to the growing transport energy demand. The level of motorisation is improving in the region but developing Asia lags behind developed Asia in this respect. With growing income, the demand for personal transport is expected to increase in the future, which will aggravate environmental impacts and other externalities.

Despite significant progress in expanding energy services to the population, Asia remains one of the two most important regions where energy access remains a challenge. While electricity access has improved in many countries, the same cannot be said about clean cooking energy access. Significant investment will be required to achieve the target of universal sustainable energy provision by 2030 and Asian countries will have to leverage private capital through a strategic mix of existing and innovative funding mechanisms. Moreover, the process of universal energy access has to go beyond its technology focused solution to a people-centric approach where the needs and practices of the users are understood to develop a solution.

Although the past economic growth has been supported by fossil fuels, the environmental impacts have become clearly visible in Asia with many cities and urban areas exceeding the safe air quality limits set by the World Health Organisation. The region has taken initiatives to harness renewable forms of energies such as hydropower, solar energy, wind and biofuels. Asian countries had installed more than 83 GW of solar photovoltaics (PV) and some concentrated solar power capacity by 2015. Cost competitiveness of solar PV, favourable policies in the region and innovative financing options have supported this growth. Similarly, Asia is a major player in wind power development, and China, India, Japan and South Korea are major manufacturers of wind

turbines and their components. Asian governments have adopted supporting policies to promote wind power and China is the world leader in terms of installed capacity. The region has significant hydro-resource potential as well but only a small part of it has been developed so far. The environmental impacts of large hydropower development and the geopolitical constraints of connecting resource areas with demand centres have affected hydro resource development in the region. The region has significant biofuel potential but managing the life-cycle impacts remains important. As the countries try to balance economic growth and energy sector development, renewable energy resources and technologies will play an important role in reducing the carbon intensity of the sector.

Facing the challenges of ensuring energy security while minimising environmental degradation and climate change threats, the energy sector in Asia has been evolving in terms of governance and policy regimes. The growing energy needs of the region will require large investments in developing infrastructure and the region needs comprehensive policies to support sustainable infrastructure development. This in turn requires adapted governance arrangements that create an enabling environment for investment in smart infrastructure, moving away from the legacy technologies. Countries in the region have undertaken varying degrees of energy sector reform. For example, in the electricity sector, the traditional vertically integrated structure has been replaced with single buyer models or some competitive elements in the structure and in many cases, independent regulation has been introduced. However, most countries have been unsuccessful in implementing the reform processes fully. A common set of threats to reforms and energy security include uneconomic pricing policies being followed in many countries of the region and fragmented markets with limited integration and coordination. As a result, the individual country efforts towards decarbonisation and energy security remain fragmented and weak. The need for greater coordination and regional integration comes out as a main theme of this book. The successful example of Greater Mekong Sub-region where a number of beneficiary countries working together to develop low-carbon energy resources for mutual benefits stresses the importance of a regional approach. The ASEAN Power Grid initiative or South Asia energy integration could help achieve wider regional and national benefits.

Conversely, the region has significant diversity in terms of economic development, population growth, urbanisation, resource endowments, social structures and human factors. Consequently, one solution will not fit all cases and the unsuccessful sector reform initiatives confirm that the standard design approach does not work. The local conditions, political support and long-term policy objectives will always influence the governance mechanisms and countries will have to search for the best option through a trial and error process. The Chinese reform highlights this approach and through a gradual process of experimentation and careful untangling, the country is moving towards a more competitive environment while pushing aggressively for the mitigation of the environmental effects of energy use.

Final reflections

As Asian countries progress with their economic development in the 21st Century, the socio-economic changes that shaped its development, namely population growth and demographic transition, rapid economic growth, unprecedented urbanisation and the rise of the middle income class, will continue to manifest their influences. However, the pace and level of change will not be the same or similar in all countries. It is anticipated that the remaining low income countries of the region will try to move to the middle income category while the others will inch forward to emerge as high income countries. These transformations will have immense implications for the energy sector of the region.

While the past economic growth was driven by industrialisation and export-led demand, the next phase of development will also focus on the needs of a growing urban population and the burgeoning middle income class. It is also likely that the manufacturing base spreads across the low and medium income countries of the region to take advantage of the cheap workforce and perhaps weaker regulations and enforcements. Consequently, the composition of the GDP will change for many countries: high value addition from industry will be taken over by service-based activities in existing export-dominant countries while the industry share will rise in countries where industrialisation picks up. With more than 60% of the population living in urban areas by 2050, many of whom are relatively affluent, the domestic market will be lucrative for product manufacturers and industries. This section of the population is likely to imitate the lifestyles of their international counterparts and this has the potential of dramatically increasing the energy demand in the residential sector and the transport sector. The demand for commercial fuels will increase and the preference for electricity and flexible fuels will amplify. In contrast, the rural population will expect better access to energy services, where location of residence will not hinder their development potential. This section of the population along with the rising share of the older population in the region can have a somewhat dampening effect on demand, as they are likely to continue with less energy intensive habits.

Clearly, security of energy supply ensuring affordable and reliable provision of energy will remain a major policy issue and preference for cheap local resources such as coal cannot be ruled out. However, the dangers of degrading the local environmental, the expectation of a better quality of life commensurate with new-found affluence by a larger section of the population and the threats of changing climate will militate against heavy reliance on a dirty fuel. Thus the decarbonisation efforts of the energy sector will have to be pursued with greater conviction and political will. This will in turn demand a suitably adapted governance mechanism that better coordinates the development of the energy sector, greater integration with neighbours and eventually other sub-regions to exploit the benefits of economies of scale and coordinated sector development, and learning from one another. Surely, the energy sector of the region holds a fascinating future. As the countries of the region adjust and adapt to unfolding challenges in an attempt to define an appropriate sector development strategy, newer opportunities for further research will be presented.