

Chapter 2

Background: Growing Demand for Electricity in South and Southeast Asia

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South and Southeast Asia's projected growth in electricity demand tracks with this region's overall economic transformation, with greater industrial activity, novel applications in agriculture and transportation, and rising per capita income spurring new consumption.⁴ However, as **Table 1** suggests, additional drivers behind the region's demand growth vary widely on a country-by-country basis. For some countries, such as India, Cambodia, Lao PDR, and Myanmar, a key factor is the ongoing task of extending basic access to electricity to a sizeable share of their respective populations. The Energy and Resources Institute in India has done extensive research and modeling in this space and has noted that for India, in particular, electrification and transmission across states present an additional challenge when each of the states are at various stages of development.⁵ Other countries, such as Indonesia and Viet Nam, are closer to or have already achieved universal access to electricity, but are nonetheless undergoing robust economic growth or other demographic changes that are adding to their total demand requirements.

Meanwhile, the fact that the level of national development, population size, and patterns in consumption vary widely between countries means that not all these changes equally shape regional outlooks. For example, as of 2020, over 80% of total electricity demand in Southeast Asia came from just four countries: Indonesia, Viet Nam, Thailand, and Malaysia.⁶ Looking out to 2050, this imbalance is expected to continue, though with Malaysia's and Thailand's relative weight diminishing and the Philippines' growing.⁷ Similar trends can be observed in South Asia, where demand from India dramatically outstrips that of its neighbors (though with greater demand requirements from a growing Pakistan and a geographically small yet densely populated Bangladesh expected by midcentury).⁸

⁴ Shigeru Kimura and Han Phoumin, eds., 'Energy Outlook and Energy Saving Potential in East Asia 2019,' ERIA, https://www.eria.org/uploads/media/0.Energy_Outlook_and_Energy_Saving_Potential_2019.pdf.

⁵ A.K. Saxena et al., 'Transitions in Indian Electricity Sector 2017–2030,' The Energy and Resources Institute, February 2017, 3, <https://www.teriin.org/files/transition-report/mobile/index.html#p=3>.

⁶ Courtney Weatherby, 'Renewable Energy in Southeast Asia,' in 'Powering Southeast Asia: Meeting the Region's Electricity Needs,' National Bureau of Asian Research (NBR), NBR Special Report, December 2020, https://www.nbr.org/wp-content/uploads/pdfs/publications/sr89_poweringsoutheastasia_dec2020.pdf.

⁷ Kimura and Han, 'Energy Outlook and Energy Saving Potential in East Asia 2019.'

⁸ Robert F. Ichord, 'Transforming the Power Sector in Developing Countries: Geopolitics, Poverty, and Climate Change in Bangladesh,' Atlantic Council, January 9, 2020, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/transforming-the-power-sector-in-developing-countries-geopolitics-poverty-and-climate-change-in-bangladesh/>.

Table 1: Access to Electricity

Country	1990			2000			2012			2018
	Rural	Urban	National	Rural	Urban	National	Rural	Urban	National	National
Cambodia	5.0	36.6	19.2	9.0	49.9	16.6	18.8	91.3	31.1	91.5
Myanmar	.	.	.	.	.	.	.	.	32*	66.3
Lao PDR	39.7	100.0	51.5	40.0	68.7	46.3	54.8	97.9	70	97.9
Brunei Darussalam	56.4	70.5	65.7	61.2	72.7	69.4	67.1	79.0	76.2	100
India	38.7	86.5	50.9	48.4	98.6	62.3	69.7	98.2	78.7	95.2
Indonesia	.	.	66.9	.	.	.	.	.	74**	98.5
Viet Nam	84.5	100	87.9	86.6	96.9	89.1	97.7	100.0	99	100
Philippines	46.4	85.5	65.4	51.9	92.3	71.3	81.5	93.7	87.5	94.8
Malaysia	89.2	97.3	93.2	93.0	98.5	96.4	100	100	100	100
Singapore	99	100	100	99	100	100	99	100	100	100
Thailand	82	75.2	80	87.0	72.6	82.5	99.8	100	100	100
Australia	100	100	100	100	100	100	100.0	100	100	100
China	92.0	100.0	94.2	95.3	100	98	100.0	100	100	100
Rep. of Korea	92.0	95.0	94.2	95.3	98.7	98	100	100	100	100
Japan	100	100	100	100	100	100	100	100	100	100
New Zealand	100	100	100	100	100	100	100	100	100	100
United States	100	100	100	100	100	100	100	100	100	100

Note: * The number was taken from the presentation of Khin Seint Wint, Renewable Energy Association of Myanmar, 2014. ** The number was taken from 'ASEAN Guideline on Off-grid Rural Electrification Approaches,' ASEAN Center for Energy, 2013.

Source: World Bank, 'World Development Indicators,' 2021; and Kimura and Han, 'Energy Outlook and Energy Saving Potential in East Asia 2019.'

1. Implications

Keeping in mind this level of subregional variation, two general observations about the outlook for power sectors in South and Southeast Asia should be noted at the outset. The first is that for many of the region's economies, a first order challenge remains securing reliable and affordable access to necessary energy supplies. For several countries – particularly those in Southeast Asia – this also means grappling with the added implications of shifting trade dynamics and becoming a net importer for the first time in history.⁹

Indonesia was once the largest supplier of liquefied natural gas (LNG) in the world before it began importing the fuel in 2012. Malaysia remains one of the largest producers of LNG, but it too has been increasing imports to keep up with rising demand, a trend that is also occurring in Thailand. In a recent report by the Oxford Institute of Energy Studies, it is estimated that Indonesia, and potentially Malaysia as well, may stop LNG exports altogether after 2035 if no new offshore or nonconventional production projects are pursued.¹⁰ Elsewhere in the Indo–Pacific, Japan, and the Republic of Korea remain almost completely dependent on fossil fuel imports, while Australia and the United States have been providing needed supply diversification for the region (see Appendix I for additional context on the outlook for US natural gas policy).

The rise of national strategies to achieve carbon neutrality by midcentury pose new questions for how countries will source their energy and power needs. Such dynamics can create powerful anxieties that, if not well-managed, could further contribute to rising resource nationalism and geopolitical tension.¹¹ Moreover, with major cities across the region seeing rapidly worsening air pollution, many South and Southeast Asia governments are increasingly interested not only in securing more energy supplies but also in revisiting their strategies for managing energy demand and CO₂ emissions.

The second observation is that booming electricity demand has already put immense pressure on existing power grids and transmission infrastructure. This is something that has, at times, triggered blackouts in India, Thailand, and the Philippines.¹² Demand for improved access to electricity is based in part on the logic that such access will result in better socioeconomic outcomes, improving the quality of life and the income of a country's people.

As studied by the World Bank, blackouts undermine social, health, and economic advancement by reducing the ability for children to learn at home, forcing families to use kerosene or other fuels that increase indoor air pollution, and requiring businesses to rely

⁹ Han Phoumin, 'The Need for Quality Infrastructure to Meet Rising Energy Demand in the ASEAN Region,' in 'Powering Southeast Asia,' 33.

¹⁰ Mike Fulwood, James Henderson, and Ieda Gomes et al., 'Emerging Asia LNG Demand,' Oxford Institute for Energy Studies, September 2020, 37, <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2020/09/Emerging-Asia-LNG-demand-NG-162.pdf>.

¹¹ Clara Gillispie, 'US–Australia Energy Cooperation in the Indo–Pacific,' NBR, January 10, 2020, <https://www.nbr.org/publication/u-s-australia-energy-cooperation-in-the-indo-pacific>.

¹² Fan Zhang, 'In the Dark: How Much do Power Sector Distortions Cost South Asia,' World Bank, December 12, 2018, <https://openknowledge.worldbank.org/bitstream/handle/10986/30923/9781464811548.pdf>.

on generators during power outages or electricity rate hikes.¹³ Addressing blackouts and unreliable electricity access has become a key rallying cry for many countries, with massive gains made since the turn of the century across developing Asia. According to the International Energy Agency (IEA), Southeast Asian nations have brought electricity to millions of their citizens in the past twenty years.¹⁴ In India the story is even more dramatic. Two-thirds of developing Asia's new electricity connections have been built in India since 2000.¹⁵

While these expansions of access are an extraordinary success, the next step of securing a more reliable and consistent electricity supply is a necessary one to achieving the ultimate goal of developing a country's economy and improving quality of life. Researchers have suggested that the quality of electricity can have over twice the impact on household wellbeing and economic output as simply connecting the consumer to the grid.¹⁶ One study of Bangladesh's electricity sector found that, even without taking into account the benefits of better conditions for education and the empowerment of women, the country's rural households would see \$480 million in increased annual income if power supply became constant.¹⁷ To provide the full benefits of expanded access, governments must ensure that grids are able to deliver power consistently to consumers.

Grid-level investments, market reforms to attract foreign investment, and other country-wide efforts are important to improving access, but the 'last mile' of connectivity can be a stumbling block in achieving desired outcomes. Analysis of electricity quality in India has shown significant disparities even between households in the same village, alongside regional variations.¹⁸ Additionally, households that struggled to register or receive other forms of government aid appeared similarly unable to benefit from electrification efforts, leaving some of the most vulnerable citizens out of programs aimed at improving their quality of life. This suggests that national-level efforts should use intrastate partnerships, down to the grassroots level, to ensure widespread success of efforts to improve electricity access and quality.

And while such strains are not exclusive to developing Asia, it is worth noting that the Asian Development Bank (ADB) and other stakeholders have long suggested that the region is likely to disproportionately experience the worst effects of global climate change. In particular, events such as increasingly frequent droughts (which reduce

¹³ Zhang, 'In the Dark,' 2.

¹⁴ International Energy Agency (IEA), 'Electricity Access Rates across Southeast Asia, 2000–2040,' December 2019, <https://www.iea.org/data-and-statistics/charts/electricity-access-rates-across-southeast-asia-2000-2040>.

¹⁵ IEA, 'SDG7: Data and Projections,' October 2020, <https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>.

¹⁶ Ujjayant Chakravorty, Martino Pelli, and Beyza Ural Marchand, 'Does the Quality of Electricity Matter? Evidence from Rural India,' *Journal of Economic Behavior and Organization* 107 (A) (2014): 228–47, <https://www.sciencedirect.com/science/article/pii/S0167268114001164?via%3Dihub>.

¹⁷ Hussain Samad and Fan Zhang, 'Heterogeneous Effects of Rural Electrification: Evidence from Bangladesh.' World Bank, 2017, <http://documents.worldbank.org/curated/en/904491497275742546/pdf/WPS8102.pdf>.

¹⁸ Michael Keppler, Thomas Lutken, and Sumin Wang, 'Understanding Patterns and Impacts of Electricity Quality and Access in Northern India,' Duke University, 2019.

hydroelectric potential) or the destruction caused by earthquakes or cyclones can exacerbate existing strains on power sector infrastructure.¹⁹ Consequently, for many countries in the region, strengthening access to electricity will require not only a dramatic expansion of new infrastructure but also improvements to the overall sustainability, health, and resilience of existing systems.

A third consideration lies in individual and regional plans for clean energy transitions, as countries seek to meet climate mitigation and adaptation plans outlined at the Conference of the Parties in Paris in 2015. In order to offset the most severe effects of climate change, these plans for achieving carbon neutrality, meeting nationally determined contributions (NDCs), or establishing cleaner energy mixes have become critical aspects of policymaking and national strategies for trade and economic development. NDCs and carbon-neutral policies vary across the region to align with domestic capabilities and resources, as illustrated by the following examples.

1.1. Association of Southeast Asian Nations (ASEAN)

Rather than a specific plan for carbon neutrality, member states have agreed to reduce the energy intensity of their economies by 21.9% as part of the ASEAN Joint Statement on Climate Change.²⁰ Additionally, the statement emphasises the importance of climate mitigation efforts and calls on developed nations to fulfill their promises under the Paris Agreement to help avert the most disastrous effects of climate change in developing countries. Several countries, including Cambodia, Thailand, and Viet Nam, have submitted revised NDCs that aim to both navigate the additional burdens caused by Covid-19 and increase the targets set in their original documents.²¹

1.2. China

President Xi Jinping announced in September that China will aim to peak its CO₂ emissions by 2030 and achieve carbon neutrality by 2060. At its 14th Five-Year Plan meeting early in 2021, the Chinese Communist Party proposed cutting both energy and CO₂ per unit GDP by 13.5% and 18%, respectively.²² China is investing heavily in nuclear power and third-generation facilities to achieve these goals. Moreover, despite setting no concrete targets at the meeting, the country continues to see solar and wind capacity grow.

¹⁹ Asian Development Bank (ADB), *Climate Risk and Adaptation in the Electric Power Sector* (Mandaluyong City: ADB, 2012), <https://www.adb.org/sites/default/files/publication/29889/climate-risks-adaptation-power-sector.pdf>.

²⁰ Association of Southeast Asian Nations (ASEAN), 'ASEAN Joint Statement on Climate Change to the 25th Session of the Conference of the Parties to the United Nations Framework, Convention on Climate Change,' November 2, 2019, <https://asean.org/storage/2019/11/2-ASEAN-Joint-Statement-on-Climate-Change-to-the-UNFCCC-COP-25.pdf>.

²¹ UN Framework Convention on Climate Change, 'NDC Registry: The Latest Submissions,' <https://www4.unfccc.int/sites/ndcstaging/Pages/LatestSubmissions.aspx>.

²² Shi Yi, 'The 14th Five Year Plan Sends Mixed Message about China's Near-Term Climate Trajectory,' China Dialogue, March 8, 2021, <https://chinadialogue.net/en/energy/the-14th-five-year-plan-sends-mixed-message-about-chinas-near-term-climate-trajectory>.

1.3. India

India has not instituted a carbon neutrality goal yet, though pressure has been mounting in the past year for Prime Minister Narendra Modi to do so. India's NDC under the Paris Agreement focuses on emissions intensity per GDP, aiming to cut this ratio by 33%–35% from 2005 levels by 2030, and to increase non-fossil fuel capacity to about 40% by that year.²³ Though slowed by the coronavirus pandemic, India's target of 175 gigawatts (GW) of renewable capacity by 2022 has spurred progress toward this goal.

1.4. Japan.

In October 2020, Japan's recently elected prime minister Yoshihide Suga announced that the country would achieve carbon neutrality by 2050. He followed the announcement by releasing the 'Green Growth Strategy Through Achieving Carbon Neutrality' in December.²⁴ This strategy includes a particular emphasis on the electricity sector, which accounts for 37% of the country's greenhouse gas emissions. Power sector decarbonisation aims for a balance of increasing the share of renewables (approximately 50%–60% as a target by 2050), upgrading and ensuring the safety of existing nuclear capacity, and offsetting some thermal power through carbon capture, utilisation, and storage. For other sectors of the economy where electrification is difficult, the strategy pushes for 'recycled carbon' technologies.²⁵

1.5. Republic of Korea.

The Republic of Korea has an integrated strategy for achieving carbon neutrality by 2050 by 'creating synergies between the Green New Deal and the Digital New Deal, the pillars of the Korean New Deal.'²⁶ In addition to expanding the use of renewable energy and improving efficiency, the plan calls for expanding the role of hydrogen across the economy and improving carbon removal technologies. The Republic of Korea also is pursuing broader sustainability in its industrial sector through use of a circular economy.

²³ Chloe Farand, 'Under Diplomatic Pressure, India Considers Net Zero – but Major Hurdles Remain,' Climate Home News, February 18, 2021, <https://www.climatechangenews.com/2021/02/18/diplomatic-pressure-india-considers-net-zero-major-hurdles-remain>.

²⁴ Ministry of Economy, Trade and Industry (Japan), 'Green Growth Strategy Through Achieving Carbon Neutrality' Formulated,' December 25, 2020, https://www.meti.go.jp/english/press/2020/1225_001.html.

²⁵ 'Overview of Japan's Green Growth Strategy Through Achieving Carbon Neutrality in 2050,' presentation by the Ministry of Economy, Trade and Industry (Japan), January 2021, https://www.meti.go.jp/english/press/2020/pdf/1225_001a.pdf.

²⁶ Government of the Republic of Korea, '2050 Carbon Neutral Strategy of the Republic of Korea: Towards a Sustainable and Green Society,' December 2020, https://unfccc.int/sites/default/files/resource/LTS1_RKorea.pdf.

1.6. New Zealand

With the adoption of the Climate Change Response (Zero Carbon) Amendment Act in November of 2019, New Zealand committed its carbon neutrality goals into law.²⁷ The country aims to reduce net emissions of all greenhouse gases to zero by 2050, with the notable exception of biogenic methane. This methane, produced from agriculture and waste, has a separate target of 24%–47% below 2017 levels by 2050. Since 2008, New Zealand has utilised an emissions trading scheme to help achieve its carbon neutrality goals by giving a financial incentive to decarbonising businesses and investing in carbon sequestration.²⁸

1.7. Other developing Asian nations

Smaller countries, including those still undergoing development, have also pledged to achieve carbon neutrality. Maldives, a frequent champion of climate action due to the threat that rising sea levels pose for the small island nation, has a carbon neutrality goal of 2030, pending ‘extensive support and assistance from the international community.’²⁹ Nepal also updated its NDC under the Paris Agreement to include carbon neutrality by 2050, including efforts to electrify its transportation sector and increase renewable sources beyond hydropower.

1.8. The United States

Although President Biden has not yet released a comprehensive plan for carbon neutrality, through executive orders he has worked to fulfill a campaign promise of achieving ‘a carbon pollution-free electricity sector no later than 2035,’ as well as net zero emissions by 2050 across the economy.³⁰ The Biden Climate Plan includes proposals for doubling offshore wind capacity by 2030, investing billions of dollars in research and development for batteries and carbon-neutral liquid fuels, and investing in transmission infrastructure that will allow variable renewables to benefit from widespread interconnectivity.

Thus, power-generation requirements in the Indo–Pacific raise important economic, environmental, and even geopolitical questions that will need to be addressed by national- and regional-level decision-makers in any comprehensive, long-term development strategy. The next section explores these questions in the context of four key strategic challenges for the region.

²⁷ Ministry for the Environment (New Zealand), ‘Climate Change Response (Zero Carbon) Amendment Act,’ 2019, <https://www.mfe.govt.nz/climate-change/zero-carbon-amendment-act#:~:text=set%20a%20new%20domestic%20greenhouse,below%202017%20levels%20by%202030>.

²⁸ Ministry for the Environment (New Zealand), ‘About the New Zealand Emissions Trading Scheme,’ 2020, <https://www.mfe.govt.nz/climate-change/new-zealand-emissions-trading-scheme/about-nz-ets>.

²⁹ Ministry of Environment (Maldives), ‘Update of Nationally Determined Contribution of Maldives,’ 2020, <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Maldives%20First/Maldives%20National%20Determined%20Contribution%202020.pdf>.

³⁰ White House, ‘Executive Order on Tackling the Climate Crisis at Home and Abroad,’ January 27, 2021, <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad>.