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East Asia
Access to Energy Brief

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Current Energy Landscape

China is the world's most populous country, and also one of the world's largest countries in terms of landmass.[1] As such, what China does when it comes to energy has an impact on a huge proportion of humanity, and on a large section of the earth. China's economic miracle over the past three decades, as the country has developed into the world's manufacturing workshop, has successfully improved the standard of living of almost all its citizens, even the rural poor. Between 1990 and 2002, the number of people living under the international benchmark for extreme poverty of US$1 per day dropped from 490 million to 88 million.[2] This development has been accompanied by increasing demand for energy, both from industry as the economy grows, and from personal consumption, as standards of living rise. China's rapid economic growth and centralized government have allowed it to push for rural electrification, and data from the World Bank show that 99.7 per cent of Chinese now have access to electricity.

Although, because the country is so populous, this statistic conceals about three million people – mostly living in the country's northwest hinterlands – who lack access to electricity.[3] China has invested in renewable solutions for these rural areas. Gansu province and Mongolia take advantage of their open plains and windy conditions with wind turbines; Qinghai province has built many photovoltaic farms; upstream regions of the Huang and Yangtze rivers depend heavily on hydropower.[4] Nevertheless, these large-scale renewable projects still require a grid to distribute the power to remote communities. Northwest China's uneven, hilly landscape and dispersed pop-

1 UNDP. "Energy and Poverty in China: Challenges and the Way Forward." Bangkok, Thailand: United Nations Development Programme, 2007. http://www.snap-undp.org/elibrary/Publications/EnergyAndPovertyChina.pdf.

2 UNDP, 2007.

3 Lu, Jianan. "Energy Access in Developing Parts of China." Berkeley Energy & Resources Collaborative (BERC), February 25, 2015. http://berc.berkeley.edu/energy-access-developing-parts-china/.

4 Lu, 2015.

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ulation centres provide the same challenges to electrification faced by other rural areas around the world.[5] However, China's success in connecting almost the entire country should not be understated. Today, China is both the largest consumer and producer of energy in the world, according to the International Energy Agency (IEA), making it hugely influential in world markets. Coal-fired power plants have driven China's rapid electricity expansion and currently generate about 70 per cent of its power; China now consumes half of the world's coal and is the largest emitter of carbon dioxide.[6] However, the new Chinese leadership in Beijing is more amenable to concerns about climate change and environmental degradation. The Chinese government is pushing aggressively with a top-down approach to increase the share of renewable energy in the country's portfolio. Bloomberg New Energy Finance, a research group, estimates that China's total power generation capacity will more than double by 2030, with half of that growth made up by renewables.[7] In 2030, installed renewable capacity will be equal to that of coal. Although these large-scale efforts will go a long way to green China's energy mix from a proportional standpoint, in absolute terms, China's coal capacity will continue to grow by about 25 gigawatts per year – the equivalent of two new, large coal plants each month.[8] Other countries in the region, such as Korea and Japan, also have 100 per cent access to electricity, and very high rates of modern cooking fuel use – but with their own interesting histories and future challenges that will be discussed below.

Cookstoves in China

Although high-quality electricity connections are com-

5 Ibid.

6 Bloomberg. "The Future of China's Power Sector – Executive Summary." Bloomberg New Energy Finance, August 27, 2013. http://about.bnef.com/white-papers/the-future-of-chinas-power-sector/.

7 Bloomberg, 2013.

8 Bloomber, 2013.

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mon in almost every part of China, almost half (47 per cent) of all Chinese households use solid fuels for cooking and heating.[9] Current trends also suggest this will not change much in the future. The IEA estimates that 280 million Chinese people will still depend on solid fuels for their heating and cooking needs in 2030.[10] Of the approximately 263.8 million people living in China's rural areas, more than half rely on wood or agricultural residue for cooking, and another 57.6 million people rely on coal.[11] The negative health effects of solid fuel are serious: household air pollution (HAP) from burning biomass is responsible for an estimated one million premature deaths each year in China — significantly more than the number of deaths attributed to urban outdoor air pollution.[12] Additionally, locally produced coal with high levels of impurities is a major cause of endemic fluorosis and arseniasis. In 2000, for example, nearly 34 million people in 201 counties were affected by coal-burning endemic fluorosis.[13] As in other developing regions of the world, in rural China it is women and children who bear the greatest health burden from HAP, as they spend the most time indoors cooking. In colder provinces, exposure to particulate matter doubles during the winter months.[14] The most efficient solution to mediate these adverse health effects would be for households using solid fuels to move up the energy ladder to modern alternatives such as liquefied petroleum gas (LPG) or electricity; however, these solutions are far

9 EnergyMap. "Energy Poverty in China." EnergyMap, 2015. http://energymap-scu.org/energy-in-china-spotlight/energy-poverty-in-china/.

10 EnergyMap, 2015.

11 World Bank. "China: Accelerating Household Access to Clean Cooking and Heating." East Asia and Pacific Clean Stove Initiative Series. The World Bank, September 2013.

12 Zhang, Junfeng, and Kirk R. Smith. "Household Air Pollution from Coal and Biomass Fuels in China: Measurements, Health Impacts, and Interventions." Environmental Health Perspectives 115, no. 6 (February 27, 2007): 848–55. doi:10.1289/ehp.9479.

13 World Bank, 2013..

14 Baumgartner, J., J. J. Schauer, M. Ezzati, L. Lu, C. Cheng, J. Patz, and L. E. Bautista. "Patterns and Predictors of Personal Exposure to Indoor Air Pollution from Biomass Combustion among Women and Children in Rural China: Biomass Smoke Exposure in Rural China." Indoor Air 21, no. 6 (December 2011): 479–88. doi:10.1111/j.1600-0668.2011.00730.x.

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more expensive than solid fuels, and require extensive infrastructure and costly stoves. These barriers to modern cooking and heating fuel mean that many families will choose to continue to rely on solid fuels. Therefore, improved cookstoves – that burn fuel more efficiently than open pit stoves and vent fumes outdoors – are the next best solution. In the 1980s and 90s, the Chinese government ran the National Improved Stoves Program (NISP), one of the world's most successful stove programs, that distributed about 180 million improved cookstoves. However, since then the dissemination of improved stoves has not kept pace with the access to energy challenge; at current rates, it would take decades for advanced stoves to reach all rural households.[15]

To better implement solutions to HAP, it helps to understand why people choose their cooking and heating fuels in the first place. The solid fuel households choose depends on the region they live in. In Central China, for instance, coal accounts for two-fifths of household cooking energy, while the country average is just one-quarter. Coal is the predominant fuel used for heating in rural households without central or electric heating across the country – with the exception of Southwest China, where wood predominates.[16] In general, fuel availability is the primary consideration for households when selecting energy sources: biomass straw is preferred in agricultural areas, animal dung predominates in pastureland, and firewood is most popular in mountainous regions.[17] In addition to availability, fuel must be accessible. For example, households in some areas may not be able to access firewood because gathering it is restricted by policy or regulations.[18] Fuel must also be affordable, something that depends on household

15 World Bank, 2013.

16 Ibid.

17 Ibid.

18 Ibid.

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income and broader economic opportunities. Finally, fuel must be culturally acceptable; in other words, it must conform to the lifestyles and food taste preferences of community members. For example, the widespread use of solar cookers in Tibet is driven not only by the region's abundant solar reserves, but also by the portability of solar cookers that fits well with the nomadic lifestyle of Tibetan farmers.[19]

Since the heyday of NISP, China has transitioned from a Communist to a mixed economy, and today the private sector is responsible for the development and dissemination of improved cookstoves. To stimulate a more rapid uptake of improved stoves, the World Bank has partnered with the Ministry of Agriculture to create the China Clean Stove Initiative (CSI) in 2012. CSI helps businesses to develop dissemination programs that are based on local conditions such as fuel availability, climate, lifestyle, and income level. The World Bank hopes that this market-based initiative, coupled with education programs and targeted government subsidies for capital expenditures, will help to generate a sustainable proliferation of more efficient and cleaner cookstoves in rural China.

Post-Fukushima Energy Security in Japan

The 2011 Tohoku earthquake that devastated northeastern Japan, and caused the meltdown of the Fukushima Daiichi nuclear power plant, forever changed the energy future of Japan and all of Asia. After the oil price-shocks of the 1970s, Japan, which at the time relied heavily on oil for electricity generation, developed a comprehensive strategy to transition its economy to nuclear power.[20] Forty years later, after the devastation of the Fukushima disaster, Japan is trapped in

19 Ibid.

20 Kitazume, Takashi. "For Energy Security, Japan Urged to Diversify Sources." The Japan Times Online, November 24, 2012. http://www.japantimes.co.jp/news/2012/11/24/business/for-energy-security-japan-urged-to-diversify-sources/.

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another bind; it has shut down almost all of its nuclear power plants, which, before the disaster, were generating about 30 per cent of domestic electricity.[21] To fill this energy gap, Japan has turned to natural gas. However, with almost non-existent domestic reserves, the country has had to rely on imports from the world market that come with fluctuating prices and security risks. The result of this increased demand for natural gas is inevitably higher prices, not only for Japan but for the whole East Asia region.[22] Japanese gas imports rose from 70 million tons in 2010 to 87.3 million tons in 2012, an increase of almost 25 per cent in two years.[23] Along with soaring import volumes, the total value of gas imports increased by 70 per cent over the same timeframe.[24] These costs are eventually passed on to the consumer. On top of paying more for gas, the Japanese government has implemented a feed-in tariff (FIT) system to encourage renewable energy growth, and introduced a new tax on fossil fuels to combat climate change – both policies that eventually raise energy costs for households.[25] Although Japan is a highly developed and industrialized nation with 100 per cent access to electricity and clean and modern cooking fuels, these price increases place the poorest and most vulnerable members of society at risk of falling into energy poverty.[26] This is a component of the nuclear disaster, and of the proposed national shift back to fossil fuels, that is rarely discussed in academia or the Japanese media. One paper – prepared for an American journal – estimates that when energy prices double, the proportion of households in the lowest income decile suffering energy poverty (defined, in this case,

21 Kitazume, 2012.

22 Itoh, Shoichi. "Energy Security in Northeast Asia: A Pivotal Moment for the U.S.-Japan Alliance." The Brookings Institution, March 2013. http://www.brookings.edu/research/opinions/2013/03/12-energy-security-itoh.

23 Itoh, 2013.

24 Ibid.

25 Okushima, Shinichiro. "An Analysis of Energy Poverty in Japan: Evaluating Its Potential Future." Grauate School of Systems and Information Engineer, University of Tsukuba, 2014. http://tinyurl.com/zdtppxf

26 Okushima, 2014.

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as "the condition of lacking the resources necessary to meet basic energy needs") increases to more than 40 per cent.[27] Add to this estimate the fact that the share of low-income households in Japan is increasing because of an aging population and sluggish economy. Finally, those most likely to fall into the low-income decile, and thus energy poverty, as prices increase, are vulnerable populations such as single parents with dependent children, the elderly, and single-person households.[28] A discussion of the trade-offs between the risks of nuclear power, climate change, and high energy prices is long overdue to occur at many levels of Japanese society.

Successful Rural Electrification in South Korea

South Korea in particular has demonstrated extraordinary success in electrifying its rural areas, and may hold many important lessons for other countries seeking to do the same. Rapid expansion of the electricity system went hand in hand with a broader transformation in the country; in one generation South Korea went from aid recipient to donor – something that today is a major source of national pride.[29] Its successful rural development was no accident. In the early 1970s, the country's authoritarian president Park Chung Hee implemented a program he called Saemul Undong, or the New Community Movement.[30] Today, international organizations such as the United Nations Development Programme and the Asian Development Bank credit Saemul Undong, in part, with the country's improved rural incomes and standard

27 Okushima, Shinichiro, and Azusa Okagawa. "Energy Poverty in Japan: How Does the Energy Price Escalation Affect Low Income and Vulnerable Households?" United States Association of Energy Economics, 2013. http://www.usaee.org/usaee2013/submissions/OnlineProceedings/OkushimaandOkagawaUSAEEproc.pdf

28 Okushima, 2014.

29 The Economist. "Pastures New." The Economist, December 6, 2014. http://www.economist.com/news/asia/21635608-south-korea-exports-rural-modernisation-scheme-1970s-pastures-new.

30 Reed, Edward P. "Is Saemaul Undong a Model for Developing Countries Today?" In International Symposium in Commemoration of the 40th Anniversary of Saemaul Undong. Seoul, Korea, 2010. http://asiafoundation.org/resources/pdfs/SaemaulUndongReedSept2010FINAL.pdf.

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of living.[31] Saemul Undong has become semi-mythologized in South Korea today. School children learn how Park Chung Hee gave nearly every one of South Korea's rural villages 335 bags of cement. Some villages used the cement to pave roads and repair bridges; others used it replace thatch roofs with tiles, depending on their own self-determined needs. Villages that were deemed successful (about half), were then awarded more cement, and steel rods.[32] The movement focused on potentially profitable rural activities, such as farming ginseng, chilies, or oysters. Profits from these activities were reinvested in the community as better seed varieties or new machinery. Villages were required to pool half of their savings into local banks to participate in the movement, and women's groups organized to help stamp out gambling and boozing.[33] As the end cumulative result of these policies, rural incomes grew from an average of 255,800 won in 1970 to 1,531,300 in 1979 – an increase of almost 500 per cent.

In terms of energy, electrification was a major component of Saemul Undong. Between 1965 and 1979, South Korea went from providing only 12 per cent of rural villages with electricity, to providing 98 per cent of villages with power.[34] In a paper from the Centre of Development at Cambridge University, the authors argue that it was vital that South Korea's rural electrification experience was both a top-down and bottom-up approach, balancing local control and participation with government control.[35] However, perhaps the most important lesson that South Korea has to offer the developing world, when it comes to energy access, is the importance of situating energy initiatives in the context of broader economic growth and

31 ADB. "The Saemaul Undong Movement in the Republic of Korea: Sharing Knowledge on Community-Driven Development." The Asian Development Bank, 2012. http://alltitles.ebrary.com/Doc?id=11016010.

32 The Economist, 2014.

33 Ibid.

34 van Gevelt, Terry. "Rural Electrification and Development in South Korea." Energy for Sustainable Development 23 (December 2014): 179–87. doi:10.1016/j.esd.2014.09.004.

35 van Gevelt, 2014.

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development. Saemul Undong succeeded because it allowed rural people to earn more income, and in turn invest that income in their own energy infrastructure, which could then allow them to generate an even greater income. Ultimately, rural electrification programs can only succeed if the people they target clearly see the benefits of participation and development. The lasting good of Saemul Undong was the changes that it brought to the overall mindset of the people. It helped to overcome the national mindset of chronic defeatism, and demonstrated what could happen with a "can-do" attitude, a shared vision of a better life for all, and an infectious enthusiasm propelled by volunteerism at the community level.[36]

36 ADB. "The Saemaul Undong Movement in the Republic of Korea: Sharing Knowledge on Community-Driven Development." The Asian Development Bank, 2012. http://alltitles.ebrary.com/Doc?id=11016010.