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Sufficiency in China's Energy Provision: A Service Understanding of Sustainable Consumption and Production

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Introduction

China is a significant energy consumer and greenhouse gas emitter. As the world's largest primary energy consumer, China stood for almost one-quarter of the global primary energy consumption in 2019, twice the EU's (BP, 2020). Around 40 per cent of all Chinese emissions and 11 per cent of global CO₂ emissions come from Chinese coal power plants alone (Alva & Li, 2018). China's power sector has contributed to more than 45 per cent of China's total historical carbon emissions (Zhang et al., 2020b). The economic turnaround experienced in China since 1978 has increased incomes and the national gross domestic product in part through actively embracing consumerism, to the extent that we can talk about a type of 'consumer socialism' (see Hansen, 2020, this volume). Decades of environmental exploitation and widespread pollution of air, soil and water have

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accompanied the development process (Shapiro, 2012). Finding approaches to reduce the anthropogenic impact on global climate change and resource use is a real struggle. A burgeoning amount of research links this challenge with the pervasive and elusive dominance of capitalism and economic growth (e.g. Kallis et al., 2020; Wilhite, 2016), and there is growing consent that economic growth cannot be sustained long-term within planetary biophysical boundaries (see Hickel, 2020; Jackson, 2017; Raworth, 2017). Seventeen years ago, Wilhite and Norgard (2004: 991) argued that it is 'neither ethical nor even practical to argue for restrictions in overall energy growth in these [China and India] and other developing countries'. This chapter studies China's electricity demand and attempts to assess whether this point still holds today. Such an analysis is perhaps even more important after the results of the COP26 climate summit in Glasgow, where China, India and other countries remained adamant that poor countries have a comparatively low responsibility for climate mitigation. The argument made by Wilhite and Norgard (2004) was that the rich countries of the world should mainly take responsibility to reduce emissions and energy use. Developing countries such as China and India should be allowed to continue their increased energy consumption since the energy growth experienced was mainly related to 'the development of basic services and infrastructure for homes, businesses, transport, health and public services' (Wilhite & Norgard, 2004). In other words, two tenets will be addressed in this chapter: (1) is energy growth in China mainly about developing basic services and infrastructures? Furthermore, (2) is it ethical or practical to argue for restrictions in energy growth in China?

The working hypothesis of this chapter is that the main point made by Wilhite and Norgard (2004) still is valid: we need to change from efficiency thinking to *sufficiency* thinking, that is, the possibility of having *enough* of something for a particular purpose (see Darby & Fawcett, 2018), and the onus should still be on the affluent population of the world. Nevertheless, despite having a communist party at the helm, China can be called a 'socialist market economy' (Hansen et al., 2020), implying that it organises its economy according to market-based and government-guided principles and acts as a growth engine for global capitalist endeavours (e.g. Curran & Tyfield, 2020).¹ The Chinese government has been relatively successful in reducing poverty in China since 1978, and the lives of millions of poor

people have been greatly improved as a result of Xi Jinping's poverty reduction policies (Bikales, 2021). Still, inequality has grown alongside economic development in the past 40 years (Kanbur & Zhang, 2005). Although inequality today appears to be plateauing (Kanbur et al., 2021), it is still considerable. Income inequality levels in China used to be similar to the Nordic countries, but they are now getting closer to US levels (Piketty et al., 2019). In 2015, the top 10 per cent of China's population received 41 per cent of the total national income, compared to 27 per cent in 1978 (ibid.). In comparison, the bottom 50 per cent share of the population only had a 15 per cent share of incomes in 2015, down from 27 per cent in 1978 (ibid.). Although income as a metric does not give the whole picture, this inequality hints at a set of challenges connected to economic growth experienced worldwide. It is related to waste, excess and overconsumption by a small group of people at the expense of a large majority of the population. As pointed out by Wilhite (2016: 24), 'life in capitalist societies is immersed in an interlocking set of narratives, materialities and incentives that has embedded the seeds of growth and accumulation in many of the practices of everyday lives'. In other words, by looking at electricity services in China, the idea of this chapter is to identify constructions of growth and accumulation that go beyond what is considered necessary for a good life—however difficult that may be to define—and start a discussion that opens up for alternative practices fitting within an environmentally safe space (Raworth, 2017).

This chapter qualitatively explores China's current development path by presenting a social science analysis of electricity consumption and energy services. The analysis will not encompass the whole energy sector but will look mainly at the services that electricity provides domestically in an urban Chinese context. Seeing needs and demand as socially constructed and developed over time through a variety of influences (see, e.g. Rinkinen et al., 2020), the chapter analyses and assesses the services provided by electricity. Understanding service rather than input and output or supply and demand is increasingly popular in the academic and the policy world. For instance, with the increase of popularity of the sharing economy, the focus on need and ownership is central: people do not need a drill; they need a hole; they do not need a car; they need to get from A to B. Recent research focussing on mobility as a service (MaaS) is a good example of this (see, e.g. Wong

et al., 2020). Inspired by notions such as the ‘negawatt’ and the idea that people do not consume kilowatt-hours but ‘services such as hot showers, cold beer, lit rooms’ (Lovins, 1990: 21), social science scholars such as Wilhite, Shove and Lutzenhiser started focussing on the role of services instead of the energy consumed (e.g. Wilhite et al., 2000). The gist of the argument was that efficiency efforts focus too much, e.g. on how a room can be heated more efficiently per square metre, ignoring what the energy is for (keeping bodies warm), leading to higher indoor temperature or more rooms heated. In other words, needs are socially constructed, making the ‘upper boundaries’ of their supply fuzzy—are we talking about needs, wants or luxuries? (Wilhite et al., 2000). Such questions require a perspective considering broader concerns, such as how habits and routines have evolved over time (*ibid.*). For this reason, this chapter looks at services as part of domestic everyday life habits and routines. Embedded in all of this is the fact that ‘policies and processes of production, provision and consumption are saturated with incentives, infrastructures, and technologies that are designed for high and increasing energy use’ (Wilhite, 2016: 88). Thus, looking at services is not enough to suggest changes—we also need to understand the broader context that took part in the co-production of those needs in the first place (Wilhite et al., 2000).

At this point, it might be clarifying to look briefly at China’s energy status. In 2019, coal, gas, oil and biomass fuelled 69 per cent of China’s electricity mix (chinaenergyportal.org, 2020). Hydropower made up 18 per cent of the electricity mix, and solar and wind together about 8.6 per cent (*ibid.*). In only 10 years, China’s electricity consumption has doubled (Zhang et al., 2020c), and during the same period, the proportion of renewable energy in the mix has only increased (Korsnes, 2020a). Since coal is readily available and due to concentrated coal-centred efforts since 1949, China is heavily reliant on coal as its primary fuel to produce electricity (Smil, 2004). China has about 13 per cent of global coal reserves, and the reserves are diminishing quickly (Yi-chong, 2017: 30). The so-called reserves to production ratio, showing the remaining amount of the resource measured in time, is only 35 years for coal (*ibid.*). About 70 per cent of all electricity is consumed by China’s large industry sector, although growth rates currently are higher in the service sector (Zhang et al., 2017). Nevertheless, although most coal is used for electricity generation, ‘coal use

in the residential sector is also one of the top sources of air pollutant emissions due to direct combustion' (Zhang et al., 2020a: 1). Given that both emissions and electricity can be associated with China's industry sector, emissions are not only connected to domestic consumption but also exports. As Weber et al. (2008) calculated, about one-third of China's total emissions were connected to producing goods exported internationally.

The case of China accentuates the challenge that it is to provide essential services to 1.4 billion people sustainably, safely and healthily. China's electricity consumption has increased rapidly with substantial government support, as providing electricity to the Chinese people is high on the agenda of the Chinese Communist Party (see, e.g. Korsnes, 2020a). The bulk of social science research on sustainability and China has focussed on what happens on the production or the supply-side of the equation, with emphasis on issues such as innovation (e.g. Steinfeld, 2010; Tyfield, 2017), new-to-the-world products (e.g. Breznitz & Murphree, 2011) and renewable energy (e.g. Korsnes, 2020a). Although such a focus admittedly is exciting and important, social science research on sustainability that is taking a deeper look at how demand has been constituted appears to be scarce (Liu et al., 2016). This chapter aims to provide such a perspective, and the chapter is organised as follows. The following section provides more detail on understanding services and the social construction of demand as analytical concepts used here. Then, Sect. "Sustainable Consumption in China" discusses some overarching matters of concern regarding research on sustainable consumption in China. Section "Household Electricity Consumption" delves deeper into China's domestic electricity consumption. Lastly, the chapter concludes with a discussion of how—if at all—it can be argued that electricity consumption can or should be reduced in China today and in the future.

Services and the Social Construction of Demand

Wilhite and Norgard (2004) point out that a way to look at how consumption can be reduced is to study the *services* that energy or natural resources provide (Wilhite & Norgard, 2004). As already alluded to,

energy, for instance, provides light, heating, or cooling. Instead of focussing on technological efficiency, which unwittingly tends to expand our levels of comfort and convenience, a focus on services forces the question of what is needed and or what purpose (Wilhite et al., 2000). As an example, take a modern-day fridge, which is more energy-efficient. However, it is also bigger, often ending up using the same amount of energy as an older and smaller but less efficient one. Although efficiency has increased, one should stop and ask why the fridge has grown and what types of chain reaction this could lead to (e.g. increased food waste). Reasons the fridge increased in size are not only because some engineers decided it but are connected to broader questions of urban food supply such as shopping habits (e.g. frequency, online, malls) and associated concepts of freshness and safety (Rinkinen et al., 2019). Failing to question the idea of desired services in the first place leads to a reproduction of increased energy and resource-intensive ways of life (Shove, 2003). A focus on services can help to probe reductions in material and energy use without compromising life quality and well-being. Such a focus implies asking tough questions that involve negotiations between comfort and constraint. To be sure, such tough questions are not up to me as an author to answer—and it indeed is not the intention of this chapter to argue that those who already have little should continue to have little. Instead, since perspectives that move away from economic growth and always having more of something are lacking, this chapter is an academic exercise that starts poking and prodding into the social constructions of demand itself. Focusing on services is a concrete way to begin such an endeavour. In other words, ‘having little’ and ‘having enough’ are socially defined sizes that are not necessary or inevitable—human needs change and are collectively moulded, and as research has shown time and again, they could be less energy and resource intense, without compromising life quality (e.g. Guillen-Royo, 2015; Hickel, 2020).

Another reason to argue for a more nuanced policy approach is that a single measure alone will not be enough to keep impacts of energy systems within planetary boundaries (e.g. Springmann et al., 2018). Policy to address reduced environmental impacts has traditionally been

focussing on efficiency, optimised technologies and supply-side measures. For instance, the general policy recommendation in China is to improve the energy efficiency of particular household appliances and technological processes (Andrews-Speed & Ma, 2016). Such approaches fail to recognise how supply and demand are connected and that commodity chains and daily life mutually shape each other through an interconnected flow of materials, knowledges and discourses (Leslie & Reimer, 1999).

Looking at electricity, it is clear that a focus on efficiency and the supply-side still has some merit. For instance, in developing China's solar PV and wind industries, there has been a need to balance the need for industry creation and with avoiding energy and resource waste (Korsnes, 2020a). Calculations show that the solar PV industry only recently has started contributing positively to the climate: 'Despite the negative environmental effect of the PV industry in the initial stages (due to the heavily export-oriented strategy), stimulation of the domestic market resulted in effective CO₂ reduction in the most recent stage' (Shubbak, 2019: 1010). Problems of excess capacity have not only been found in the renewable energy industries but appear to be a more general element in China's technological catching-up strategy (Rock & Toman, 2015). In 2014, the overcapacity in Chinese iron and steel industries alone corresponded to the total iron and steel capacity in Europe (Rock & Toman, 2015: 250). Another example is also telling; in 2018, one-fifth of all homes in China were empty, equalling 50 million apartments (Bloomberg.com, 2018). They were largely empty because of housing speculation in second and third homes that are used very little or not at all (ibid.). Given that the construction sector in China has been found to have 'the largest impact on water-energy-food uses' (Deng et al., 2020: 9), China's real estate market is entirely out of touch with present-day demand. Much of the overcapacity problem appears to be related to so-called 'zombie firms', i.e. 'firms that would go bankrupt due to poor earnings but survive with external support from governments or financial sector' (Shen & Chen, 2017). Such examples mean that the energy supply sector can still improve. However, they also imply that demand—as co-produced by the government, the industry and originating from people—plays a central but underestimated role.

Sustainable Consumption in China

We humans have for a long time made use of natural surroundings not only for our survival but also for increased comfort. We have planted vegetables, built shelters and ensured tempered bodies. Human and animal muscles have supplied kinetic energy, while wood and crop residues supplied energy for heating and cooking (Smil, 2004). During the nineteenth century, water and wind—and soon after, coal and oil—started making a difference in mechanical energy (ibid.). The changes that followed the Industrial Revolution transformed energy conversion and the types of services that became necessary and considered ‘basic’ needs for humans. With the contemporary situation as a point of departure, this section looks at already existing literature on consumption and sustainability in China.

The only literature review on China with a perspective where services and social practices are taken into account appears to be the work done by Liu et al. (2016). They first provide their understanding of sustainability, similar to the one deployed here, and then review the literature on food, household energy and transport. The research they reviewed on household energy consumption in China covered both supply-side and demand-side perspectives, but the bulk of the research reviewed looked at the characteristics of household energy use by employing econometric analysis, census data, or surveys. As they point out, such studies helped understand the bigger picture but left internal dynamics of domestic energy consumption, instead, in the dark. For this reason, Liu, Oosterveer and Spaargaren (2016: 18) conclude that a combined analysis is necessary, looking, for instance, at ‘how to interpret the interconnections between household energy (resources and technologies) provision and household energy consumption practices’. A common denominator for the research they reviewed was that ‘individualist economic perspective[s]’ typically were employed (Liu et al., 2016: 17).

A more recent literature review on sustainable consumption in China was conducted by Shao (2019). They reviewed 121 Chinese language articles and analysed the quest for sustainable consumption with the backdrop of developing a circular economy. The results were divided into

four categories: policies and regulations, the green awareness of consumers, the circular economy, and barriers. As these four categories indicate, the study acknowledges that not all change is relegated solely to changed consumer behaviour. Nevertheless, the study does not go into detail to show how change could be achieved. This is most clear when barriers to achieving sustainable consumption behaviour are discussed, as these are mainly presented in a table, which lists regulatory barriers as the most significant barriers, followed by technical barriers, then market and finance and lastly; 'cultural barriers, information obstacles, and lack of city- and regional level practices' (Shao, 2019: 1513). It remains relatively unclear how these barriers have originated in the first place and how regulatory or technical barriers impact, shape, and interrelate with cultural barriers. Given that until recently, the Chinese government has wanted, encouraged and worked very hard to shape consumption behaviours that have a higher energy use, it is not surprising that government regulations that intended to achieve higher consumption now can be seen as barriers to sustainable consumption. As an example of this, the Chinese government has subsidised electricity prices for residential, industrial, agricultural and commercial consumers since 1978 to stimulate demand—electricity being in many ways synonymous with economic development (Pu et al., 2020). On average, but varying between provinces in China, electricity prices for households have been lower than for industry and commercial sectors (Korsnes, 2020a).

In a more in-depth study looking at how Chinese people interpret sustainability, Liu et al. (2019a) found that the leading interest for the interviewees was to ensure that future generations could live well. Another critical aspect that was reported was to promote personal *suzhi*, which roughly translates into English as 'quality' (Anagnost, 2004), but more broadly refers to 'the physical and mental condition of people, their personal ability and cultivation' (Liu et al., 2019a: 1190). The concept of *suzhi* is closely associated with the idea of a middle class, which defines what could be called a 'high' quality or character of people, implying that they have high *suzhi* (Curran & Tyfield, 2020). Those with high *suzhi* typically have a 'university education, good manners, a white-collar job and an urban residence' (Goodman & Chen, 2013: 70). Although high *suzhi* also is associated with some form of moderation and restraint (Liu

et al., 2019a), it is clear that those with high *suzhi* correspond to groups that through their middle class status have a higher level of consumption than unemployed, or uneducated, rural migrants (Goodman & Chen, 2013). Liu et al. (2019a) point out that the level of *suzhi* can be raised through education.

Nevertheless, a focus on 'high' and 'low' levels of *suzhi* can generate new and unexpected forms of inequality in China relating to what is simultaneously considered high *suzhi* and distanced from the poor and 'uncultured' (Curran & Tyfield, 2020). The way this would pan out in terms of sustainability would then depend entirely on what 'high' and 'low' *suzhi* means and its implication for who can take part in and mobilise such a status. For example, a recent case study of urban Nanjing looked into sustainable consumption practices and found that reducing consumption and waste was considered sustainable (Liu et al., 2019b). Values of frugality and saving (the virtue of *qinjian jieyue*, i.e. 'being diligent and thrifty') were found to be central, and particularly avoiding food waste appeared to be a recurring topic. Still, practices of reduced consumption and waste were competing with, even undermined by, the idea of *mianzi* (i.e. maintaining 'face', personal self-esteem) and the practice of *guanxi* (interpersonal connections) (ibid.). Since these norms are central to Chinese customs, it was found that they could lead to significantly wasteful behaviours. An example of food waste was highlighted, where one interviewee described a situation: 'if you order a lot of food when you dine out or go out with friends. And you can't finish it, but you want to save face, so you won't wrap it up and take it away' (ibid.: 1314). What is more, green behaviour was found to be associated with health, which in turn implied that green consumption was necessary in order to be protected 'from [an] unhealthy food climate rather than caring for the products' environmental performance' (Liu et al., 2019b: 1320).

Social science research on domestic energy consumption in China focuses heavily on attitudes and behaviour compared to routines, habits and everyday life. For instance, Andrews-Speed and Ma (2016: 24) point out that current policy suggestions to improve energy efficiency in China are too technical and should instead concentrate on behavioural aspects. Their study reviews literature showing that "environmental concern and energy-saving consciousness can shape energy-saving and other 'green'

behaviours" in China (p. 27), and they find that 'the obstacles to changing behaviour included a general unwillingness to sacrifice comfort, the inconvenience in trying to purchase better appliances, a lack of trust in key actors, and a lack of knowledge about how to save energy' (p. 36). Their overall conclusion is that improved information at local levels could be beneficial in increased energy saving in China. Although such information may prove effective in and of itself, it might be too narrow to only consider attitudes, behaviours and choices as variables relating to energy saving (see Shove, 2010). The problem is that focusing only on individual behaviour ignores the ways in which energy use has a history and is embedded in a large variety of habits, routines, aspirations and material arrangements that have co-evolved over time. In order to understand what can change, it is necessary to ask wider questions about socio-temporal organisation and what energy is for in the first place. This would go hand in hand with an understanding of urbanisation itself, work-life balance, mobility regimes and concepts of comfort and convenience.

To summarise, a look at the literature on sustainable consumption in China reveals that much focus has been on individualist and market-centred perspectives and policies. The studies that have gone into more detail have shown important aspects connected to the meanings associated with more sustainable consumption, such as mobilising and negotiating concepts of high status and focussing on behaviour and choices. The following section looks at household electricity consumption with a view to understand better services and demand.

Household Electricity Consumption

Since the Chinese Communist Party came to power in 1949, there has been a staggering change in how most people dwell in China. Until the end of the 1980s, there was a housing shortage due to inadequate government investments in the housing sector—rapid industrialisation was the main priority (Lee, 1988). In 1979, the rural living area per capita was 22.5 m², and the corresponding urban figure was 26.1 m² (Wang et al., 2020). Since the reform and opening up in 1978, investments in housing had increased drastically, and by 2016, the average rural living area per

capita had increased to 45.8 m² and to 36.6 m² in cities (ibid). Wall and ceiling insulation and insulated windows remain uncommon, with one survey showing that about one-third of households have installed double-glazed windows (Zheng et al., 2014). Increases in electricity demand have been driven both by industrial production and increases in domestic electricity use, and after 1978, household electricity use increased, particularly due to an increased usage of electric appliances (Smil, 2004). Before Deng Xiaoping, it was very uncommon with refrigerators, and cooking (and heating in the north of China) was done with highly inefficient coal, wood, or straw-fired stoves (ibid.). Today, more than 80 per cent of the households live in apartment buildings with less than 6 floors, and per 100 households, there are 89 refrigerators, 91 washing machines, 120 televisions and 89 computers (Zheng et al., 2014: 128). The typical apartment has a private kitchen and a toilet (Zhang et al., 2020a). Appliance penetration in urban China is similar to 'rich' countries such as the US. For instance, only 82 per cent of homes have washing machines in the US because communal washing facilities are still common. In urban China, the corresponding percentage is 81.8 (Rao & Min, 2018). When it comes to mobile phones, 93 per cent of US homes have them, compared to 100 per cent of homes in China (ibid.).

In existing research on domestic energy consumption in China, higher income levels have typically been associated with higher household energy use and GHG emissions (Feng et al., 2011). Wang et al. (2011: 3550) looked at the potential for electricity saving for Beijing residents and found that 'economic benefits, policy and social norms, and past experience may have a positive correlation with household electricity-saving behaviour, while the discomfort caused by electricity-saving activities, may exert a negative effect on it'. Another analysis using big data concluded that household energy could be reduced by introducing people to 'the relationship between their energy use and carbon emissions (or climate change), providing more specific information about their energy consumption, as well as encouraging them to replace with more efficient appliances.' (Zhou & Yang, 2016). A survey conducted by Niu et al. (2016) found that income, diversity of electrical appliances, and household size were the main factors that influenced residential electricity consumption. A more recent example points out that not only energy prices

and incomes but also household and building characteristics impact domestic energy consumption (Zhang et al., 2020a). An interesting contrast to some of these studies is the comparative analysis made by Hori et al. (2013: 361), who compared five Asian cities and found that 'energy-saving behavior is associated with social interaction'. Social interactions, such as willingness to participate in the community and returning favours to neighbours, were associated with lower energy use. In other words, those who were more socially reserved appeared to have a higher energy use. Although still somewhat superficially, the research summarised here shows that a wide variety of factors impact energy consumption. Energy use is socially and culturally embedded, and what is considered 'high' or 'low', or 'wasteful' and 'energy saving' is highly context-dependent.

Residential energy consumption represented about 11 per cent of China's total energy use in 2012 (Zhou & Yang, 2016). Electricity accounted for 15 per cent of the total household energy supply, and it was used for a variety of purposes, such as appliances and light, cooking, cooling, and heating water (Zheng et al., 2014: 131). Firewood was used for cooking and heating, and solar was mainly used for water heating (ibid.). As noted by Zheng et al. (2014: 134), a striking difference between China and other countries was the amount of energy used for cooking: 'Chinese households use a larger share of energy for cooking, accounting for 23 percent of household energy consumption versus 6 percent to nearly zero percent in other countries'. The difference was explained in two ways: one, energy used for cooking was high because the energy for other purposes was used more frugally, and two: 'living within the rich culinary culture of China, families form strong taste preferences and put relatively more time into cooking—hence using relatively more energy.' (ibid.: 134). In other words, cultural variability and the importance of certain domestic practices will explain some differences in energy use. A recent study looking at energy poverty from a Chinese point of view found that almost one-fifth of Chinese households can be considered 'energy-poor', and '46% of the energy-poor houses are in short of modern energy consumption and are sensitive to tariffs, with a level of electricity consumption lower than the basic demand' (Lin & Wang, 2020: 1). Energy-poor households were primarily located in central and western areas of China, where urbanisation and economic development

are lower (*ibid.*). With an increasingly urbanised population, domestic practices become more streamlined—and strongly shaped by material environments such as the availability of shopping malls, supermarkets, ordering take-away food, as well as domestic technologies such as vacuum cleaners, fridge-freezers and microwave ovens (see Korsnes & Liu, 2021). This will, in turn, contribute to increasingly materially and energy-intense domestic practices, which all are changing along with understandings of what it means to have a good life.

In the spirit of Hal Wilhite (2009), a brief look at space cooling is instructive. Space cooling through air conditioners (AC) is a relatively novel comfort technology that has taken hold over the mid-twentieth century (Wilhite, 2008). China today produces about 70 per cent of all AC units globally and covers about 22 per cent of the world's installed cooling capacity (IEA, 2019). Globally, the demand for space cooling has grown fastest in China in the past 20 years (*ibid.*). Ten per cent of China's total electricity growth since 2010 has been associated with the usage of ACs, and in 2017 space cooling made up 17 per cent of peak electricity loads (*ibid.*). In 2016, per 100 urban households, there were 124 AC sets, compared to 81 in 2005 (UNFCCC, 2018). Around 60 per cent of Chinese households today own ACs. As income levels and urbanisation rates increase—or as I would rather put it, as understandings of comfort escalate are reproduced and normalised—this number is expected to reach 85 per cent by 2030 (IEA, 2019). The growth of AC internationally is not necessarily connected to a need that people suddenly experience (Wilhite, 2009). Instead, it has been co-constructed over time with a range of actors, including the 'built environment (materials and designs), which in turn have been favoured by powerful commercial actors, including the energy industry, the construction industry and even the banking industry' (Wilhite, 2009: 85). A recent study by de Feijter and van Vliet (2021) shows that the Chinese government supports retrofits and energy-saving but that a range of mismatches with householders' practices make them unfit. One telling example was a householder in the city of Mianyang, who said: 'I need to use more air-conditioning in the Summer which is costly [...] my apartment has become only hotter since the trees in the public space have been removed during the retrofit' (de Feijter & van Vliet, 2021: 11). It is also easy to understand that people prefer AC

to natural ventilation given the high air pollution in many Chinese cities, which cause people to stay inside as a form of air pollution avoidance (referred to as 'inverted quarantine') (Liu et al., 2021). One could still ask why ACs and space cooling have become so fashionable in China in the past years. Since China has been a prominent actor in manufacturing AC units, the Chinese government is to some extent bound to have supported its use domestically, for instance, in constructing a large number of copy-paste high-rise apartment buildings that do not allow for passive cooling opportunities. In short, they have a built-in need for active cooling in the summer, which strongly shapes the types of cooling strategies available. This leads to a ratcheting up of material and energy-intensive practices that are interconnected in a wide array of ways, as alluded to above.

Discussion and Conclusions

There has recently been much talk about 'prosumers' within the energy world, an idea that typically involves decentralised renewable energy, that is, a rooftop solar PV panel, where electricity is used locally or sold to the grid (see e.g. Korsnes, 2017). I spent 3 years searching for the Chinese prosumer (and I never found them—for various reasons, see Korsnes, 2020a). China is today world-leading in installing decentralised rooftop and ground-mounted PV systems that generated a valuable added income to the families that had them and undoubtedly has had a positive effect on energy poverty reduction in rural parts of China (Geall & Shen, 2018; Korsnes, 2020b). Finding ways to gauge the multiple ways in which consumption and production are interconnected provides a better understanding of how demand is not only met—it is also produced (Rinkinen et al., 2020). As this chapter has shown, today's household electricity consumption levels are connected to a wide range of things such as increased incomes and urbanisation, housing, large construction projects, infrastructure, air pollution, or expectations of leading healthy lives. Connecting back to the discussion of concepts such as 'high' and 'low' *suzhi* and a growing middle class introduced earlier, the negotiations between the privilege of increased consumption and the duty of being

environmentally conscious and sustainable will likely be defining for the extent to which the Chinese urbanisation process will end up to be sustainable. A question that emerges is: how many AC units, washing machines, mobile phones, or refrigerators is enough, and how many is too much? How is this intertwined with what it means to have a good life? As pointed out above, Chinese urban homes already have the same number of washing machines as US homes—but is the number still increasing? Will it reach a level corresponding to France, or Japan, where 100 per cent of homes have washing machines (Rao & Min, 2018), or will it surge even higher? Recently China has seen counter-movements to the culture of overworking and consuming, such as the *'tang ping'* or 'lying flat' concept that advocates a passive lifestyle with reduced consumption, not having a job, not getting married, nor owning property (He & Qu, 2021). Such movements may indicate that China is becoming more and more sensitised to concepts of wellbeing and good lives instead of always needing to produce more and work harder.

Failing to ask questions of what energy is for and failing to see how it is embedded in material environments and business interests, e.g. relating to the Chinese construction sector, may make the sustainability challenge in China even greater. This realisation forms part of the answer to the questions set out in the introduction. Instead of assuming a pre-given understanding of energy needs and welfare, we can argue that 'basic services and infrastructure' is up for negotiation. On the one hand, some aspects of ensuring enough energy for the population are still about basic services and infrastructures today, particularly in western provinces that still experience shortages. On the other hand, we might have to ask if there are upper boundaries for our consumption levels that are not absolute necessities. In this way, it could be 'ethical'—but perhaps not 'practical'—to argue for restrictions in the overall energy growth of China—if it implies restrictions for those that use excessively and increases for those that have too little. Given the size of China and the number of increasingly rich people, it would certainly make sense to say that consumption that is wasteful or mainly related to luxuries, such as owning a second or third home, could be halted. In other words, although there are still segments of the Chinese population where essential services and infrastructures are needed, there may also be a segment of the population where

limits could be introduced. The argument of this chapter is not to say that limits should be imposed willy-nilly, but rather that it is time to start a discussion of what is 'too much', in addition to the existing discussion on relative poverty, which has centred on the question of what is 'too little' (e.g. Bikales, 2021).

To be sure, the Chinese Communist Party is known to take environmental hazard and climate change issues increasingly seriously (e.g. Korppoo et al., 2020). Concepts such as 'ecological civilisation', taken to the highest political levels in China with Xi Jinping, claim to achieve a harmonious relationship between economic growth, people and nature (Hansen et al., 2018). On November 11, 2021, the 'third resolution' was adopted, an agreement on how to interpret the history of the Chinese Communist Party. In this resolution, the concept of 'common prosperity' was advanced, and economic growth was addressed as a problem: 'We must never sacrifice the environment in exchange for transient economic growth'. It is argued that economic growth must slow down, and 'eco-friendly' growth should prevail—similar to the tenets of 'ecological civilisation' (Hansen et al., 2018). Nevertheless, whether it is possible to combine any form of growth with the preservation of nature is highly questionable—primarily since the problem of ever-expanding needs is not addressed. A combination of efforts that consider both efficiency and sufficiency measures is likely needed. This includes the daunting challenge of finding alternative ways of ensuring tempered homes and good lives without wreaking any more environmental havoc. The intense industrialisation efforts that China has in any new sector they enter domestically and globally, whether new apartment buildings or air-conditioning units, make such efforts much harder. Thus, the day the Chinese Communist Party can prioritise the environment and health in front of continued economic growth is when radical changes that achieve 'common prosperity' can arise.

Note

1. See also Tyfield (2017) for a more in-depth discussion on 'post-capitalism' and liberalism 2.0 (as opposed to neoliberalism) in China.

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