Chapter 1 Climate-Energy policy: Domestic policy process, outcome and impacts

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Abstract

As an introduction, this chapter aims to define the five key concepts throughout this volume to develop a logical framework that links them: the climate-energy conundrum, climate-energy policy, socio-technological transition, the resource curse, and the disruption of livelihood and ecology. In short, the global climate change concerns raises the climate-energy conundrum, while technological and institutional lock-in makes it hard for the government to advance socio-technological transition of the energy infrastructure system toward a low CO_2 emission pathway. Climate-energy policy is generally created as a compromise among the conflicts of interests between multiple stakeholders, which would be less effective in reducing CO_2 emission and bring domestic and/or international implications or both, including a resource curse and the disruption of livelihood and ecology. The framework also points out that, climate-energy policy and its domestic and international implications vary by country, alluding to possible consequences found through in-depth analyses of later chapters.

1. Emergence of climate-energy policy

States have implemented energy policies to meet the needs of multiple stakeholders at multiple levels of governance. These are “four As of energy security” (availability, accessibility, affordability and acceptability) (APERC 2007), address to environmental and social concerns, and low vulnerability of vital energy systems that combines their exposure to risks and their resilience (Cherp and Jewell 2014).

Climate change poses an additional challenge to the state. Given the increasing pressure on the food and energy system as highlighted in the assessment reports of the International Panel on Climate Change (IPCC) (IPCC 2007; 2014), it is perceived as a matter of the survival for human beings. To effectively combat climate change, policy sectors that affect the climate change, as well as will be affected by climate change are required to integrate or mainstream climate change into their policy process and policy output (Dupont 2016).

Among these policy sectors, energy sector is paid special attention, as it contributes to at least two-thirds of global greenhouse-gas (GHG) emissions (IEA 2017). While carbon dioxide (CO_2) emissions, which accounts for the majority in the GHG emissions, become flat during 2014-16, they go along far above the 450 scenario pathway that can attain the global 2 °C climate change

target[1] (IEA 2017). In this regard, tackling energy-related CO_2 emissions is crucial for climate change mitigation.

To move the energy sector toward a low CO_2 emissions pathway, additional energy-related climate policy measures are required, set aside the existing and planned ones. Among them, increase energy efficiency and scale up the use of renewables in power generation and beyond are listed up as cost-effective measures in the marginal abatement cost schedule (McKinzey & Company 2009). They are estimated to account for 80 percent of the reduction in the 450 scenario (IEA 2017).

2. Coherence with concerns about energy security

Climate policy measures can clash with energy security. While they enable energy-importing countries to increase energy security by reducing fossil fuel combustion, and energy dependency on unstable or hostile regions, or over-dependence on few suppliers, they can weaken energy security of energy exporting countries by reducing demand, political security and bargaining power vis-à-vis importers (Sharples 2013).

Energy-importing countries also face difficulties in effectively integrating climate concern into energy policy for the transition to a low CO_2 pathway. Energy systems are featured by suck investments, long operating lifetimes and complementary capital investments (Schmidt, Matuo, and Michaelowa 2017). They are also strongly path dependent and deeply embedded in society in terms of norms, values, laws, modes of governance, social relations and culture (Verbong, and Geels 2010). These features make the system be prone to technological and institutional lock-in, and become so economically, institutionally and politically entrenched that is difficult to reconfigure (Fouquet 2016).

This is why climate change is reframed as a discourse that is acceptable by the regime and the society. It is reframed as a decarburization discourse that gives priority to nuclear power in countries where nuclear power prevails, as it is compatible with the prevailing sense of energy security. However, liberalization of energy market makes cost of nuclear highly uncertain, making private investors and energy companies hesitate to invest (Toke 2013). In addition, Fukushima nuclear disaster raises concerns over the safety and security over the nuclear reactor, forcing the state to give up a decarburization discourse (Szarka 2013). A decarburization discourse lose support even where vertically integrated monopolistic or oligopolistic supply system of electricity is justified, and incumbent suppliers can capitalize on the excess rents to gain comparably large power and resources to pursue regulatory capture (Mori 2017b).

Climate change is reframed as green economy or ecological modernization in Germany and the United States to a less extent. While they succeed in emerging renewable energy industries and

diffusing renewable energy, they show contrasting results in the amount of diffusion and emissions reduction. High concern about over-dependence on one supplier, coupled with social structure that accepts necessary changes including higher electricity price, drives diffusion of renewables in Germany (Hillebrand 2013).

In contrast, climate change is reframed to justify policies conceived to protect what are seen as energy-security objectives in Brazil (Vieira and Dalgaard 2013). The main driver of Brazil's energy-security policies continues to be strategic concerns over availability and reliability of supplies. In this line, it revitalizes biofuel and hydroelectricity programs as climate-energy policy programs for energy security purpose.

These observations indicate that policy process and outcomes to tackling energy-related CO_2 emissions vary by how a country reframes climate change to attain energy security at the same time. They also suggest that coverage of energy security differs by domestic imperatives (Grundmann, Scott and Wang 2013).

This book defines policy outcomes to tackling energy-related CO_2 emissions as climate-energy policy to analyze their impacts on CO_2 emissions as well as energy demand and supply, economic growth and society.

3. Domestic impacts

Climate-energy policy can exert influence on emitters' decisions through direct intervention, change in market price and discourses. In particular, accelerating renewables can potentially break the lock-in and reconfigure the prevailing energy regime for several reasons (Mori 2017a). First, it can increase competition and diversity into the monopolistic or oligopolistic market. It will eventually alter the prevailing market dynamics within the energy sector as its generation cost approach grid parity through technological feedback effect. Secondly, such competition and diversity squeeze excess rent to the incumbent suppliers, making them incapable of compensating opposition stakeholder groups and of propagating the population. Thirdly, it can foster emerging local industry poised to benefit from increased renewable energy growth. Fourthly, decentralized or distributed energy technologies offer greater flexibility and can therefore more readily organize and enable distributed political and economic power, and vice versa, generating policy feedback effect.

However, attempts to reconfigure the prevailing energy system open up frictions and develop into struggles of power (Stirling 2014). Reconfiguration not only threatens economic interests and political influence of incumbent energy suppliers, but also requires additional burden for reconfiguration. On the other hand, incumbent suppliers have comparably large power and resources not only because states depend on them to secure stable supply, but also because they can exert influence in three ways: relational networks and close contacts with senior policymakers,

internalization of the ideas and interests of incumbents through frequent contacts, and corporate political strategies such as information strategy, financial incentives, organized pressure and direct lobbying (Geels 2014). Once policymakers and incumbents organize alliance, it can turn into a stable and hegemonic ‘historical bloc’ (Levy and Newell 2002) that stabilize and reproduce existing paradigms and structures to reinforce the current regime. Reconfiguration becomes hard-fought inter- and intra-scalar contestations between old and new institutions, agents and technologies (Rock et al. 2009). It can make struggles last several decades to be settled (Lockwood 2015), which poses inherent limitations on rapid change (Smith and Raven 2012).

The attempts will also clash with the affordability of energy that has been the priority in the existing energy, industrial, and military policies if it simply implies a rise in energy price (Aldy et al. 2009). It can hit the middle class the most severely because they are required to pay both higher gasoline prices and higher electricity tariffs (Blobel et al. 2011). In particular, carbon pricing causes two side effects of unequal impacts on industrial competitiveness and regressive impacts on income distribution and (Andersen and Ekins 2009; Ekins and Speck 2010). These side effects are likely to hinder social acceptance of climate change mitigation, and motivate people to vote for the political parties that express a priority for affordability over sustainability.

There are several possible ways to get out of the climate-energy conundrum. One is to create, maintain and fund a long-term policy framework. This can allow incumbents to take flexible measure to address climate change while sustaining momentum toward reconfiguration (Mazzucato 2015).

Second is to secure clear energy at an affordable price. It includes exploration of domestic oil and gas field, development of oil and gas pipeline, and acquisition of oil and gas field in foreign countries. This option can raise a conflict of interest against energy security unless energy security can be farmed as reducing reliance on energy imports. Development of domestic non-traditional oil and gas field through flacking enables the United State to take this option, at the expense of modest progress in renewables (Vezirgiannidou 2013).

Third is displacement of carbon intensity industries. Carbon pricing sparks concern over industry-sector and country competitiveness, incentivizing carbon-intensity industries to displace to countries without high abatement policies. This results in carbon leakage (Andersen and Ekins 2009).

Obviously, the second and third options can have adverse economic and environmental impacts on energy-exporting countries and host countries of these investments, including resource curse, and livelihood and ecological disruptions.

4. International impacts

4.1 Resource curse

The resource curse is defined as less economic growth, less democracy, and worse development outcomes than countries with fewer natural resources. It can be explained by Dutch disease and volatile resource revenue. Dutch disease refers to the contraction of the traded goods sector and growth in non-trade sectors in response to a resource boom and its induced appreciation of the real exchange rate. As the traded goods sector, namely the manufacturing sector, is the engine of growth and is beneficial in terms of learning by doing and other positive externalities, the contraction of the traded goods sector makes it difficult for resource-rich countries to fully recover their productivity once they loses their competitive edge when resources run out (van der Ploeg 2011). This further increases domestic consumption and imports while decreasing non-resource exports, the savings rate, wealth, and social welfare, locking the country into the vicious cycle of the resource curse.

In addition, highly volatile commodity prices make their resource revenue and economic growth highly volatile and cyclical to the commodity price, generating adverse growth effects (van der Ploeg and Poelhekke 2010).

Dutch disease can be mitigated if (a) a country uses a “park fund” for resource revenue so as not to ramp up spending too rapidly, (b) the economy is flexible in terms of openness to trade, ease of market entry by new firms and labor market flexibility, and (c) the country addresses the potential bottleneck of infrastructure and labor skills for wealth creation (Venables 2016). This implies that the right set of institutions is the key to whether countries will fall into the curse or not.

However, the existence of resource wealth can worsen the quality of institutions. It allows governments to pacify dissent, avoid accountability, and resist modernization (Isham et al. 2005) and encourages productive entrepreneurs and politicians to shift activities toward rent seeking (Tovik 2002), destroying institutions (Ross 1999). Actual political decisions depend on how resource rents affect the leader’s probability of survival. If a resource boom raises the value of staying in office, the political leader will shift resource revenue from productive toward unproductive activities. But if the leader responds to the windfall gain by offering better and more outside opportunities to rebel groups, the windfall will become a blessing (Caselli and Cunningham 2009).

Nonetheless, the extent of the curse can vary by resource. “Point source” type resources that have a limited socioeconomic linkage can cause a greater curse and result in weaker institutions (Isham et al. 2003; Auty 2006). As mining requires a huge amount of capital and advanced technologies, a few large, often transnational companies tend to operate under a concession contract with a host country’s government. While the government obtains resource revenue through tax, this

structure prompts concentration of resource wealth to a limited number of people, causing an uneven distribution. In addition, backward linkage is constrained where the host country favors imports over domestic production in input supplies, and forward linkage is stunted, as the resource-processing industry is too internationally competitive to be rapidly developed. As a result, taxation becomes a dominant resource flow, which amplifies the probability of predatory behavior, policy failure, and economic distortion due to maladroit rent seeking.

From this point of view, oil can be defined as a resource that causes curse. A few countries have managed the resource rent wisely to competitively diversify the economy, mitigating the constraints on widening backward and forward linkage. Coal can be defined as a resource that causes less of a curse. It is scattered around the country and easily accessible to a wider set of economic agents, and it is easier to create many socioeconomic linkages with coal than with oil, although wealth from coal mining can be concentrated in specific patronage networks, where a small number of large companies are given concessions on large mining areas, or small mining companies are merged.

Still, a varied extent of the curse can be observed within oil and gas rich countries. Luong and Weinthal (2010) refute that it is the structure of ownership that resource-rich states choose to manage their mineral wealth that plays a decisive role. In short, state ownership and control enable political elites to derive income exclusively from resource rents, freeing them from developing state capacity for effective taxation and increasing social expectations for distributing the state's resource income widely to the population. Private ownership and control, on the other hand, increase transaction costs for the government to exploit resource rent. This provides political elites with no choice but to seek a broad-based tax regime while it reduces social expectations for distribution.

The authors also highlight the fact that political elites in resource-rich countries can change the ownership and management. Uzbekistan and Turkmenistan have maintained state ownership and control since independence, causing political leaders to perpetuate authoritarian regimes as well as rentier and distributive states with increasing reliance on resource rent. As a result, this situation widens the wealth gap and low level of human development represented in the UNDP's Human Development Index. In contrast, Russia implemented comprehensive tax and expenditure reform and increased accountability to the population after it shifted toward private ownership and control.

These arguments suggest to us that the resource curse that might have been intensified by China's carbon-energy policies can vary by the structure of ownership of resources in energy-exporting countries as well as the type of energy they export.

4.2 Disruption of livelihood and ecology

Foreign direct investment (FDI) and the environment became a hot debate at the end of the 1990s. Despite the relatively small share of mining in world investment flows, FDI in this sector

represents a substantial part of capital formation and GDP in many developing and emerging economies (Kondo 2002). FDI flow in the resource extractive sector, including oil and gas surged in the late 1990s after they had gone through liberalization and deregulation in the structural adjustment package that aimed at attracting FDI to boost export. However, the sector, particularly in Sub-Saharan Africa was criticized for labor abuse; livelihood and ecological disruption by extensive logging, mining, and hydropower development; blood resources; proliferation of dictatorships; inefficient SOEs that are not held accountable (Moyo 2012), and eroding of transparency and human rights (Serge and Beuret 2009). Several projects have been suspended by fierce local protests over concerns of serious ecological impacts (Grumbine 2010).

Competition for FDI between countries and gaps in national environmental standards are regarded as underlying causes, creating pollution haven and propelling a global race to the bottom of social and environmental regulation. Promulgating decrees and regulations setting environmental standards often lagged behind the FDI surge, giving concessions without preparing consideration to environmental and social safeguards. A lack of institutional capacity, finance and in some cases political will, as well as lobbying by investors and their home countries, hamper efforts of some host country governments to implement effective environmental regulation (Boocock 2002). Under the unfavorable investment climate such as in Russia and Kazakhstan, only investors seeking quick returns and injecting high-risk capital are attracted regardless of ownership, posing a risk of adverse impacts on the environment and the society (Henzler 2002).

On the other hand, global market forces and political pressures can create pollution halos in developing countries, pulling the countries towards environmental policy convergence (Zarsky 2002). Companies from developed countries can push to promote the establishment of higher environmental standards and management practices through the transfer of technology and management expertise under appropriate framework conditions (Borregaard and Dufey 2002).

While pollution “havens” cannot be statistically proven, there are clearly “pollution zones” of poorer people, both within and across countries, where firms perform worse and where regulation is less effective (Zarsky 1999: 66). To address this deficiency, multilateral organizations have initiated to establish multilateral guidelines and agreements. International financial institutions (IFIs) such as the World Bank Group, including International Finance Corporation (IFC) stipulated social and environmental safeguard policies that go far beyond national regulations, requiring foreign investors to comply with them as lenders or equity holders. Underpinned by the United Nations, the Kimberley Process Certification Scheme was established that safeguards the shipment of ‘rough diamonds’ and certifies them as conflict free. The OECD drafted *Guidelines for Multinational Enterprises* that include environmental aspects, requiring member countries to convince their investors to follow them. The Equator Principles were prepared to provide financial institutions

with a minimum standard for due diligence and monitoring to support responsible risk decision-making. The Extractive Industries Transparency Initiative (EITI) was set up by governments, companies and civil society organizations to ensure benefits from the extractive industries to citizens through high standards of transparency and accountability. For this purpose, it requires countries to publish timely and accurate information on the number of license, revenue from the extractive industries and its allocation (EITI 2017).

Nonetheless, these countermeasures have two types of limitations. First, due to voluntary nature, they can work effectively only when the private investors can gain by replacing existing practices for such countermeasures, or there are sufficient external pressures exist to make the initiatives work (Gunningham 2002). Second, non-OECD investors can avoid these guidelines and agreements to make investments as long as they can make self-finance or backed by non-IFIs financial institutions that do not mind international reputations. Besides there are number of "loopholes" in host countries, such as different legal requirements by size and type of mining activity, inter-ministerial conflicts, a lack of enforcement capacity and political will on which FDIs can capitalize to obtain mining concession that can cause harmful impacts (Boocock 2002).

5. China

5.1 China's reframing of energy security

China's notion of energy security has been evolved along with the transition from the planned to the socialist market economy, and its consequence on state enterprises and the environment.

In the period of planned economy, it was defined as ensuring proper and smooth domestic supply. In the transition to the socialist market economy, the Communist Party of China and the state came to perceive that economic growth, poverty alleviation, and social stability, along with nationalism and patriot should be the foundation for its legitimacy (Chen 2012; Wang 2012). The resultant high-speed economic growth turned China into a net oil importer in the mid-1990s, and net energy importer in the early 2000s (Figure 1-1). This raises a concern about the appropriate mix of energies, and thus about the way to access them, both from a geopolitical and technological standpoint (Di Meglio and Romano 2016).

However, the country's macroeconomic reform has swung the priority in energy security back and force, restricting the Chinese government to implement a coherent energy policy or energy strategy targeted to enhance energy security (Yao and Chang 2015). It generated the trilemma among expansion of supply capacity, a structurally heavy reliance on coal and its inefficient use, and air pollution (Hatch 2003; Mori and Hayashi 2012).

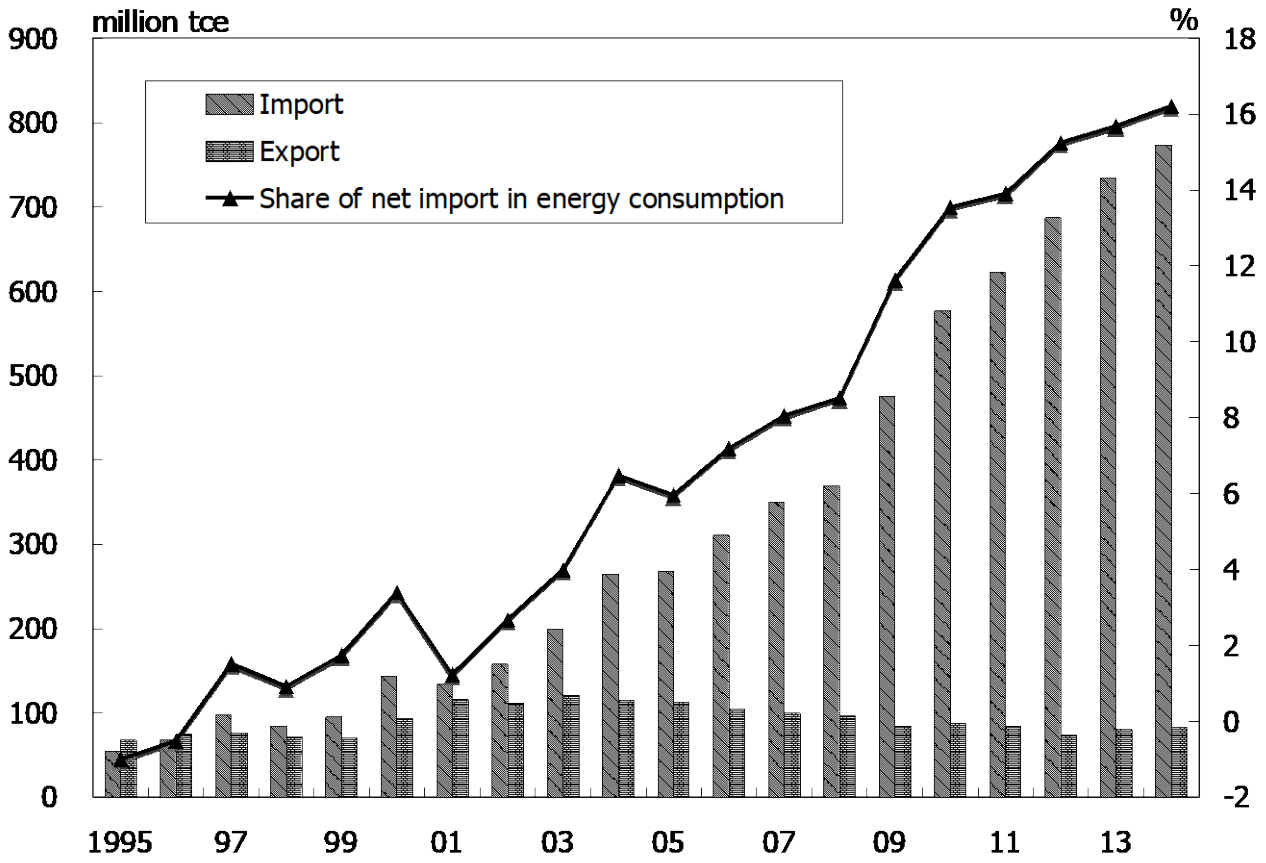

Figure 1.1 China's primary energy import and export, 1995-2014

Source: Author compilation based on China Statistics Press, *China Energy Statistics Yearbook 2009, 2015*.

In the coalmine industries, town and village coalmines (TVCMs) was stimulated for expansion to meet the increasing demand in the early 1990s, but became a target of closure in the late 1990s when the Asian economic crisis slowed it down, and state coalmines fell into financial distress due to overstaffing and high welfare costs. State coalmines were transformed into limited liability companies with the sate retaining a controlling interest in the companies.

In the power sector, construction of thermal plants was preferred than hydroelectric ones from the perspective of cost, time, reliability of operation, and the constraints of hard foreign currency (Lieberthal and Oksenberg 1988). Local governments and foreign companies were encouraged to invest in and to have their own plants. However, these plants became the targets of shut down in the late 1990s to protect the State Power Corporation of China (SPCC), and to control most of the electricity-related assets.

These consolidated state companies, however, had insufficient capacity to meet the skyrocketing demand in the early 2000s, resulting in sever blackouts in eighteen out of the thirty one provinces

in 2003. Local governments and companies revived the TVCMs, coal power, and industrial plants that had been officially closed. However, the abolishment of the ministries in charge weakened administrative capacity to oversee and provide funding for energy conservation. The fiscal and state of enterprises (SOEs) reforms discouraged local governments and SOEs to invest in clean coal technology and other environmental protection activities that required longer time to generate return. All of them made it difficult to enforce environmental and safety regulations, causing severe disasters[2], inefficient energy use, air pollution, health damage and increase in carbon emission, especially embodied one (chapter 2). Nonetheless, stringent air pollution controls simply reduced investments in coal powers and industrial plants as pollution abatement technologies often brought them little profit, and the reform of state enterprises constrained the government to offer financial support to mitigate hard budget constraints.

In response, Hu administration attempted to accelerate economic transformation to resolve the negative effects of the rapid economic growth, including energy-related environmental degradation (Yao and Chang 2015). It accelerated the re-distribution of state-owned assets and the regrouping of SOEs on the basis of market principles. The SPCC was vertically and horizontally unbundled to increase competition. State coalmines were consolidated into 13 production bases to gain competitiveness amid gradually expanded and accelerated price reform for marketization (chapter 4). These reforms created the industrial structure in the coalmine and power sector consisting of a few conglomerates with a number of small, inefficient private companies that often have market competitiveness due to cheap labor and environmental costs. Coupled with local governments' impulse toward economic growth and protection of local companies, the industrial structure posed another difficulty in getting out of the trilemma.

To address the difficulties, the government shifted the notion of energy security to the appropriate mix of energies and the way to access them, both from a geographical and technological point of view (Di Meglio and Romano 2016b). The government accepted the need for flexibility and realism in the realm of energy to secure easy access. It justified additional development of oil and gas around the world as enhancing its energy security through increasing global energy security, and reframed renewable energy as industrial policy to foster new competitive edge. It provides profit and personal career building opportunities for the main national oil companies (NOCs) to improve their performance through competition and vertical integration, while impose equal guarantee to the population and price control to be consistent with its energy security concern.

When implementing climate-energy policy, the Chinese government, in principle, reframes climate change to be consistent with the flexible notion of the energy security, and employs the same instruments and agencies (chapter 3). Shi administration takes a further step into the

appropriate mix of energies, setting out the coal consumption target in the 13th Five-year plan (FYP) and the coal dependency target of below 50 percent by 2035.

5.2 Possible domestic impacts

Precious researches suggest a variety of domestic impacts that China's climate-energy policy can generate in implementation.

As for domestic impacts, it will generate regressive distributional effects on urban areas through a (Brenner et al. 2007; Ye et al 2016). It increases coal imports, which intensifies conflicts of interests with the China National Coal Association and state-owned power utilities that fell into financial distress: 70 percent of them tuned into the red and more than half owed wages despite consolidation (Wong 2014).

Third, it will intensify conflicts of interests between the government's climate and energy security concern, and NOC's profit motives. Two-thirds of the NOC's foreign investments are break-even, and only a tenth of their extracted oil is directly import into China: they sell majority in the world market (Di Meglio and Romano 2016).

Finally, it will generate renewable curtailment through rapid and large expansion of renewable energy generation capacity. China has gone through large curtailment since 2010 under the electricity infrasystem featured by a prohibition against direct provision to end-users, sluggish grid connectivity, priority on fossil fuels in grid connection, and overcapacity of coal power (Fang et al. 2012). Although the rate of idle wind power capacity dropped to 17 percent in 2012 and to 11 percent in 2013, about 16 TWh were still wasted due to curtailment (REN21 2014). Solar photovoltaic (PV) also encountered curtailment of 12 percent as a national average in 2015 (REN21 2016) as a result of huge investments in large-scale plants.

5.3 Possible international impacts

China's aggressive quest for resources has been criticized for causing or intensifying livelihood and ecological disruption in resource-exporting countries. Set aside the above-listed stylized reasons, it was criticized for cutting Western countries' monopoly over political presence and that of their companies' over market and resources, unfair competition, and corruption allegations (Burgis 2015). China's infrastructure finance has also criticized for the dominant acquisition of development projects by Chinese companies (Copper 2016), tying to labor and intermediary goods imports from China, and contributing less to economic diversification (Cáceres and Ear 2013), even if the oil for infrastructure scheme is viewed as a practical way of mitigating the resource curse in Africa (Brautigam 2009).

In Asia, the direct investments from China have been criticized for their livelihood and

ecological disruptions by logging in Cambodia (Cáceres and Ear 2013), mining in Myanmar (Cockett 2015), hydropower dam development in the upper Mekong river basin (Lyu 2015), and coal power in Indonesia (Hervé-Mignucci and Wang 2015). Increasing dependency on China is criticized as shrinking local manufacturers (Serge and Beuret 2009), losing skilled jobs (Pupphavesa et al. 2013) in Thailand, and depriving workers of opportunities to develop skill and capacity in Cambodia (Chandarany et al. 2013). While several projects have been suspended by fierce local protests over concerns of serious ecological impacts (Grumbine 2010), the Chinese government often places pressure on the governments in the host countries to remedy the situation.

The Chinese government uses the leverage of its banking system to encourage Chinese companies to improve their environmental and social practices in their foreign business. The China Development Bank adopted the guideline in 2005 to require all firms seeking loans to take environmental impact assessment and to include environmental costs and standards in loan contracts. The Export-Import Bank of China (CEXIM) also requires several sets of environmental and social requirements for its loans in the guideline. However, the Chinese government has limited will and ability to strictly monitor and enforce their compliance. Coupled with insufficient laws, regulations and their weak governance in host countries, the weak stance of the Chinese government let Chinese companies ignore local laws and regulations, raising concerns about social and environmental impacts on local communities and trigger fierce opposition (Economy and Levy 2014).

6. Book overview

These possible consequences raise questions. Are they temporal phenomena that are caused by China's rapid and drastic macroeconomic and SOEs reforms, and the associated energy development and FDI strategies, or transformational changes that will be institutionalized? Does China's climate-energy policy, as the policy outcome of incorporating climate change concern into energy policy, give additional impacts upon the ones that prevail, or change them?

This book aims to give answers to them, taking Asian-Pacific energy-exporting countries as cases. It begins with the definition of the five key concepts throughout this volume and develops a logical framework among them. Then China is taken to explore the climate-energy conundrum and the climate-energy policy as a policy outcome, illustrating possible domestic and international consequences to raise the research questions throughout this book. To give answer to them, both qualitative analyses with in-depth case study on specific energy exporters, and quantitative analysis, such as input-output analysis and applied computable general equilibrium analysis will be made in the following chapters.

A first part is constituted by the underlying causes of the rapid increase in carbon emissions in

China, and policies and measures that the Chinese government has implemented to address them. Kiyoshi Fujikawa, Zuoyi Ye, and Hikari Ban in chapter 2 use an input-output analysis to calculate embodied CO_2 emission with the global input-output table initiated by the European Union to see if it can justify the slow development of climate-energy policy. In Chapter 3, Akihisa Mori and Mika Takehara revisit the history of China's climate policy to explore how the Chinese government has decided the detailed policy measures of climate-energy policy.

A second part analyzes domestic impacts of climate-energy policy. Nobuhiro Horii in chapter 4 explores the underlying factors behind China's recent decline in coal consumption, checking if it is a temporal phenomenon. In chapter 5, Mika Takehara revisits the gas import estimates by the International Energy Agency (2015b) and China Energy Research Society (2016) that are based on the government targets for 2015 to analyze the amount required to achieve both CO_2 emission and air pollutants reduction targets in 2030.

Kiyoshi Fujikawa, Zuoyi Ye, and Hikari Ban in chapter 6 analyze distributional consequences of carbon-energy pricing by urban and rural areas to see if it will be widely accepted. In chapter 7, Hikari Ban and Kiyoshi Fujikawa employ the Gdyn-E model and a dynamic CGE model to analyze impacts on macro-economy and energy mix in China's 2030 peak-out and INDC scenarios.

A third part explores international impacts of climate-energy policy from resource curse and ecological disruption perspective. Akihisa Mori and Le Dong in chapter 8 take six Asian Pacific and Central Asian energy-exporting countries to examine if they suffer from China-induced Dutch disease, employing the trade specification coefficient (TSC) and revealed comparative advantage (RCA) as indicators. In chapter 9, Hikari Ban and Kiyoshi Fujikawa employ the Gdyn-E model again to analyze impacts on GDP and mix of energy on Asian energy-exporting countries to see if China's climate-energy policy causes carbon leakage under the China's 2030 peak-out and the INDC scenario.

The following two chapters are in-depth country case studies. Akihisa Mori in chapter 10 takes Indonesia as a case of a coal and gas exporter to perform an analysis in view of resource governance. Seeing rapid industrialization and diversification of resource exports such as palm oil, Indonesia is evaluated as one of the resource-rich developing countries that have escaped the resource curse (Gylfason 2001). Nonetheless, it has increased its reliance on resource exports during the coal boom. Referring to Luong and Weinthal (2010), he analyzes how China has influenced the ownership structure in the oil, gas, and coal sectors. Lynn Thiesmeyer in chapter 11 takes the case of Myanmar states of Shan and Kachin to analyze the impact on livelihood of China's investment in large-scale hydropower in view of political ecology.

Our analysis ends with a wrap-up the findings in each chapter, a discussion of future strategies to move China's energy sector toward a low CO_2 emission pathway without causing harmful impacts

on energy exporting countries, delivering a remaining challenge for future research.

References

Aldy, J.E., Krupnick, A.J., Nwwell, R.G., Parry, I.W.H. and Pizer, W.A. (2010) Designing climate mitigation policy, *Journal of Economic Literature* 48(4): 903-34.

Andersen, M.S. and Ekins, P. (eds.) (2009) *Carbon-Energy Taxation: Lessons from Europe*, Oxford: Oxford University Press.

Asia Pacific Energy Research Centre (APERC) (2007) *A Quest for Energy Security in the 21st Century: Resources and Constraints*, Institute of Energy Economics, Japan.

Auty, R.M. (2006) Resource-driven models of the development of the political economy, in Auty, R.M. and de Soysa, I. (eds.) *Energy, Wealth and Governance in the Caucasus and Central Asia: Lessons Not Learnt*, Oxon: Routledge, 17-36.

Blobe, D., Gerdes, H., Pollitt, H., Barton, J., Drosdowski, T., Lutz C., Wolter M.I., and Ekins, P. (2011) Implications of ETR in Europe for household distribution, in Ekins. P. and Speck, S. (eds.) *Environmental Tax Reform: A Policy for Green Growth*, Oxford: Oxford University Press, 236-90.

Bloomberg News, China's Blue Skies Target May Make for Winter Gas Crunch, (17 August 2017), Retrieved from https://www.bloomberg.com/news/articles/2017-08-16/china-s-blue-skies-target-may-make-for-winter-gas-supply-crunch, accessed on 14 December 2017.

Boocock, C.N. (2002) Environmental Impacts of Foreign Direct Investment in the Mining Sector in Sub-Saharan Africa, in Organisation for Economic Co-operation and Development (ed.) *Foreign Direct Investment and the Environment: Lessons from the Mining Sector*, Paris: Organisation for Economic Co-operation and Development, 19-53.

Borregaard, N. and Dufey, A. (2002) Environmental effects of foreign versus domestic investment in the mining sector in Latin America, in Organisation for Economic Co-operation and Development (ed.) *Foreign Direct Investment and the Environment: Lessons from the Mining Sector*, Paris: Organisation for Economic Co-operation and Development, 55-79.

Brautigam, D. (2009) *The Dragon's Gift: The Real Story of China in Africa*, Oxford: Oxford University Press.

Brennera, M., Riddleb, M., and Boyce, J.K. (2007) A Chinese sky trust?: Distributional impacts of carbon charges and revenue recycling in China, *Energy Policy* 35: 1771-84.

Burgis, T. (2015) *The Looting Machine: Warlords, Tycoons, Smugglers and the Systematic Theft of Africa's Wealth*, William Collins.

Cáceres , S. B. and Ear, S. (2013), *The Hungry Dragon: How China's Resource Quest is Reshaping*

the World, Oxon: Routledge.

Caselli, F., and Cunningham, T. (2009) Leader behaviour and the natural resource curse, *Oxford Economic Papers* 61(4): 628–50.

Chandarany, O. Chanhang, S. and Dalia P. (2013) Impacts on China on poverty reduction in Cambodia, in Jalilian, H. (ed.) *Assessing China's Impact on Poverty in the Greater Mekong Subregion*, Singapore: Institute of Southeast Asian Studies, 297-384.

Chen G. (2012) *China's Climate Policy*, Oxon: Routledge.

Cherp, A. and Jewell, J. (2014) The concept of energy security: Beyond the four As, *Energy Policy* 75, 415-21.

China Energy Research Society (ed.) (2016) *China Energy Outlook 2030*, Beijing: Economics and Management Press (in Chinese).

Cockett, R. (2015) *Blood, Dreams and Gold: The Changing Face of Burma*, New Haven: Yale University Press.

Copper, J.F. (2016) *China's Foreign Aid and Investment Diplomacy, Volume III: Strategy Beyond Asian and challenges to the United States and the International Order*, Hampshire: Palgrave MacMillan.

Davidson, M. (2013) Transforming China's grid: Obstacles on the path to a national carbon trading system, http://www.theenergycollective.com/michael-davidson/259871/transforming-china-s-grid-integrating-wind-energy-it-blows-away, accessed on June 10, 2016.

Di Meglio, J-F and Romano, G.C. (2016a) Conclusions, in Romano, G.C. and Di Meglio, J-F (eds.) *China's Energy Security: A Multidimensional Perspective*, Oxon: Routledge, 251-4.

Di Meglio, J-F and Romano, G.C. (2016b) Introduction: From 'shaping' to 'framing' China's energy security and the example of the oil policy, in Romano, G.C. and Di Meglio, J-F (eds.) *China's Energy Security: A Multidimensional Perspective*, Oxon: Routledge, 1-21.

Dupont, C. (2016) *Climate Policy Integration into EU Energy Policy: Progress and Prospects*, Oxon: Routledge.

Economy, E.C. and Levy, M. (2014) *By All Means Necessary: How China's Resource Quest Is Changing the World?*, Oxford: Oxford University Press.

Ekins P. and Speck, S. (eds.) (2011) *Environmental Tax Reform (ETR) – A Policy for Green Growth*, Oxford: Oxford University Press.

Extractive Industries Transparency Initiative (EITI) (2017) Fact Sheet as of November 2017, https://eiti.org/sites/default/files/documents/eiti_factsheet_en_nov2017.pdf, accessed on February 18, 2018.

Fang Y., Li J. and Wang M. (2012) Development policy for non-grid-connected wind power in

China: An analysis based on institutional change, *Energy Policy* 45: 350-358.

Fouquet, R., Path dependence energy systems and economic development, *Nature Energy* 1 (2016) 1-5, http://dx.doi.org/10.1038/nenergy.2016.98.

Geels, F.W. (2014) Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective, *Theory, Culture & Society* 31(5): 21-40.

Grumbine, R.E. (2010) *Where the Dragon Meets the Angry River: Nature and Power in the People's Republic of China*, Washington DC: Island Press.

Grundmann, R., Scott, M. and Wang J. (2013) Energy security in the news: North/South perspectives, *Environmental Politics* 22 (4): 571-92.

Gunningham, N. (2002) Voluntary approaches to environmental protection: Lessons from the mining and forestry sectors, in Organisation for Economic Co-operation and Development (ed.) *Foreign Direct Investment and the Environment: Lessons from the Mining Sector*, Paris: Organisation for Economic Co-operation and Development, 157-94.

Gylfason, T. (2001) Natural resources, education, and economic development, *European Economic Review* 45: 847-59.

Halper, S. (2010) *The Beijing Consensus: How China's Authoritarian Model Will Dominate the Twenty-First Century*. Basic Books.

Hatch, M.T. (2003) Chinese politics, energy policy and the international climate change negotiations, in Harris, P.G. (ed.) *Global Warming and East Asia: The Domestic and International Politics of Climate Change*. London: Routledge. 43-65.

Henzler, M. (2002) Environmental impacts of foreign direct investment in the mining sector: The Russian Federation and Kazakhstan, in Organisation for Economic Co-operation and Development (ed.) *Foreign Direct Investment and the Environment: Lessons from the Mining Sector*, Paris: Organisation for Economic Co-operation and Development, 81-101.

Hervé-Mignucci, M. and Wang X. (2015) Slowing the growth of coal power outside China: The role of Chinese Finance, *A CPI Report*, Climate Policy Initiative.

Hillebrand, R. (2013) Climate protection, energy security, and Germany's policy of ecological modernization, *Environmental Politics* 22 (4): 664-82.

International Energy Agency (2015a) *Trends 2015 in Photovoltaic Applications: Survey Report of Selected IEA Countries between 1992 and 2014*, http://www.iea-pvps.org/fileadmin/dam/public/report/national/IEA-PVPS_-_Trends_2015_-_MedRes.pdf, accessed on July 25, 2016.

International Energy Agency (2015b) *IEA World Energy Outlook 2015*, Paris: IEA.

International Energy Agency (2017) *IEA World Energy Outlook 2017*, Paris: IEA.

International Panel on Climate Change (2007) *Climate Change 2007: Impacts, Adaptation, and*

Vulnerability, https://www.ipcc.ch/report/ar4/wg2/, accessed on January 25, 2018.

International Panel on Climate Change (2014) *Climate Change 2014: Impacts, Adaptation, and Vulnerability*, https://www.ipcc.ch/report/ar5/wg2, accessed on January 25, 2018.

Isham, J., Woolcock, M. Pritchett, L. and Busby, G. (2005) The varieties of resource experience: Natural resource export structures and the political economy of economic growth, *World Bank Economic Review* 19(2): 141–74.

Kahrl, F., and X. Wang (2015) Integrating renewable energy into power systems in China: A technical primer-Electricity planning. *Regulatory Assistance Project*, http://www.raponline.org/wp-content/uploads/2016/05/rap-e3-chinaelectricityplanning-2015-oct.pdf, accessed on June 19, 2017.

Ladislaw, S. and Nakano, J. (2011) China—Leader or Laggard on the Path to Secure, Low-carbon Energy Future, Washington DC: CSIS.

Levy D.L. and Newell P. (2002) Business strategy and international environmental governance: Toward a neo-Gramscian synthesis, *Global Environmental Politics* 2(4): 84-101.

Lieberthal, K. and Oksenberg, M. (1988) *Policy Making in China: Leaders, Structures, and Process*. New Jersey: Princeton University Press.

Lin, W., Gu A., Wang X. and Liu B. (2016) Aligning emission trading and feed-in tariffs in China, *Climate Policy* 16 (4): 434-55.

Lockwood, M. (2015) The politics of dynamics of green transformations: Feedback effects and institutional context, in Scoones, I., M. Leach and P. Newell (eds.) *The Politics of Green Transformation*, Routledge, Oxon, 86-101.

Luong, P.J and Weinthal E. (2010) *Oil Is not a Curse: Ownership Structure and Institutions in Soviet Successor States*, Cambridge: Cambridge University Press

Lyu, X. (2015) From Manwan to Nuozhadu: The political ecology of hydropower on China's Lancang river, in Matthews, N. and Geheb, K. (eds.) *Hydropower Development in the Mekong Region: Political, Socio-economic and Environmental Perspectives*, Oxon: Routledge, 54-82.

Mazzucato, M. (2015) The green entrepreneurial state, in Scoones, I., M. Leach and P. Newell (eds.) *The Politics of Green Transformation*, Routledge, Oxon, 134-52.

McKinzey & Company (2009) *Pathways to a Low-Carbon Economy: Global GHG Abatement Cost Curve Ver2.0*.

Mori, A. (2017a) Sociotechnical and political economy perspectives in the Chinese energy transition, *Energy Research & Social Science* 35, http://dx.doi.org/10.1016/j.erss.2017.10.043.

Mori, A. (2017b) Temporal dynamics of infrasystem transition: The Case of Electricity System Transition in Japan, *Technological Forecasting & Social Change*, http://dx.doi.org/10.1016/j.techfore.2017.05.003.

Mori, A. and Hayashi T. (2012) Transboundary environmental pollution and cooperation between Japan and China: A historical review, in Kazuhiro Ueta (ed.), *CDM and Sustainable Development in China: Japanese Perspectives*, Hong Kong: Hong Kong University Press, 1-22.

Moyo, D. (2012) *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*, London: Penguin Group.

Paltsev, S. & D. Zhang (2015) Natural gas pricing reform in China: Getting closer to a market system?, *Energy Policy* 86, 43–56.

PBL Netherlands Environmental Assessment Agency (2015) Trends in global CO2 emissions: 2015 Report, http://edgar.jrc.ec.europa.eu/news_docs/jrc-2015-trends-in-global-co2-emissions-2015-report-98184.pdf, accessed on September 6, 2016.

Pupphavesa, W. Paitoonpong, S., Chakrisinont, M. and Sakaeo, S. (2013) Impacts on China on poverty reduction in Thailand, in Jalilian, H. (ed.) *Assessing China's Impact on Poverty in the Greater Mekong Subregion*, Singapore: Institute of Southeast Asian Studies, 235-96.

RENS21 (2014) *Renewables 2014 Global Status Report*, http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf (last accessed November 3, 2014).

RENS21 (2016), *Renewables 2016 Global Status Report*, http://www.ren21.net/wp-content/uploads/2016/06/GSR_2016_Full_Report.pdf, accessed on July 22, 2016.

Rock, M.T., Murphy, J.T., Rasiah R., van Seters P. and Managi, S. (2009) A hard slog, not a leap frog: Globalization and sustainability transitions in developing Asia, *Technological Forecasting & Social Change* 76: 241-54.

Ross, M.L. (1999) The political economy of the resource curse, *World Politics* 51(2): 297–322.

Schmidt, T.S., Matuo, T. and Michaelowa, A. (2017) Renewable energy policy as an enabler of fossil fuel subsidy reform? Applying a socio-technical perspective to the cases of South Africa and Tunisia, *Global Environmental Change* 45: 99-110, http://dx.doi.org/10.1016/j.gloenvcha.2017.05.004.

Serge M. and Beuret M. (2009) *China en Africa: Pekin a la Conquista del Continente Africano*, Alianza Editorial Sa.

Sharples, J.D. (2013) Russian approaches to energy security and climate change: Russian gas exports to the EU, *Environmental Politics* 22 (4): 683-700.

Smith, A. and Raven R. (2012) What is protective space? Reconsidering niches in transition to sustainability, *Research Policy* 41(6): 106-19.

Stirling, A. (2014) Transforming power: Social science and the politics of energy choices, *Energy*

Research & Social Science 1: 83-95.

Szarka, J. (2013) From exception to norm – and back again? France, the nuclear revival, and the post-Fukushima landscape, *Environmental Politics* 22 (4): 646-63.

Toke, D. (2013) Climate change and the nuclear securitisation of UK energy policy, *Environmental Politics* 22 (4): 553-70.

Toke, D. and Vezirgiannidou, S.E. (2013) The relationship between climate change and energy security: key issues and conclusions, *Environmental Politics* 22 (4): 537-52.

Torvik, R. (2002) Natural resources, rent seeking and welfare, *Journal of Development Economics* 67 (2): 455-70.

Tunsjø, Ø. (2013) *Security and Profit in China's Energy Policy: Hedging against Risk*, New York: Columbia University Press.

van der Ploeg, F. (2011) Natural resources: Curse or Blessing?, *Journal of Economic Literature* 49 (2): 366–420.

Vieira, MA and KG Dalgaard (2013) The energy-security–climate-change nexus in Brazil, *Environmental Politics* 22 (4): 610-26.

Venables, A.J. (2016) Using natural resources for development: Why has it proven so difficult?, *Journal of Economic Perspectives* 30 (1): 161-84.

Verbong, G.P.J. and F.W. Geels (2010) Exploring sustainability transitions in the electricity sector with socio-technical pathways, *Technological Forecasting & Social Change* 77: 214–21.

Vezirgiannidou, S-E. (2013) Climate and energy policy in the United States: The battle of ideas, *Environmental Politics* 22 (4): 610-26.

Wang, Z. (2012) *Never Forget National Humiliation: Historical Memory in Chinese Politics and Foreign Relations*, New York: Columbia University Press.

Wong, F. (2014) Update 2-China to again levy coal import tariffs after nearly a decade, *Reuters*, October 9, 2014, http://www.reuters.com/article/china-coal-idUSL3N0S41QP20141009, accessed on July 28, 2016.

Yao, L. and Chang, Y. (2015) Shaping China's energy security: The impact of domestic reforms, *Energy Policy* 77: 131-39.

Ye, Z., Watanabe, T., Shimoda, A. and Fujikawa, K. (2016), Distributional impacts of carbon tax in China on households by region and income group, in Fujikawa, K. (ed.) *Input-output Analysis and Applied Computable General Equilibrium Model*, Kyoto: Horitsu Bunkasha, 53-61. (In Japanese)

Yuan, J., Li P., Wang Y., Liu Q., Shen X., Zhang K., and Dong L. (2016) Coal power overcapacity and investment bubble in China during 2015–2020, *Energy Policy* 97: 136-44.

Zarsky, L. (1999) Havens, hallos and spaghetti: Untangling the evidence about foreign direct

investment and the environment, in Organisation for Economic Co-operation and Development (ed.) *Foreign Direct Investment and the Environment*, Paris: Organisation for Economic Co-operation and Development, 47-74.

Zarsky, L. (2002) Stuck in the mud? Nation states, globalization and the environment, in Gallagher, K.P. and Werksman, J. (eds.) *The Earthscan Reader on International Trade and Sustainable Development*, London: Earthscan, 19-44.

[Note]

[1] The IEA creates the sustainable development scenario that can attain climate, air pollution and universal energy access targets together, in response to the effectiveness of the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development that requires states to attain the integrated multiple policy objectives.

[2] The death toll in China's coal mining in 2008 was 91,172, down 15 percent from 2007 (*China Daily*, January 17, 2009).