COAL POWER SECTOR IN CHINA, JAPAN, AND SOUTH KOREA:

CURRENT STATUS AND THE WAY FORWARD FOR A CLEANER ENERGY SYSTEM

Publication Organizations:

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C Team

Vanke Foundation

Lead Authors:

Lin Jiaqiao (林佳乔), Co-founder and Deputy Director, Rock Environment and Energy Institute

Takako Momoi (桃井貴子), Manager of Tokyo office, Kiko Network

Jieon Lee (이지언), Climate and energy coordinator, Korea Federation for Environmental Movements

Author team:

Zhao Ang (赵昂), Irene Evbade-dan, Julia Schinzel

Proof-reading and compiling:

Zhang Yinfeng (张吟峰), Jonathan Liu (刘重)

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Current Status and the Way Forward for a Cleaner Energy System

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Acronyms

BPE, Basic Plan for Long-term Electricity Supply and Demand

CBDR, Common but Differentiated Responsibilities

CCS, carbon capture and storage

CFPP, coal-fired power plant

ECA, Export Credit Agency

EIA, Environmental Impact Assessment

ETS, emission trading system

FYP, Five-Year Plan

GHG, Greenhouse Gas

GW, gigawatt

HIA, Health Impact Assessment

IEA, International Energy Agency

IGCC, Integrated Gasification Combined Cycle

IPP, Independent Power Producer

KDB, South Korea Development Bank

KEPCO, South Korea Electric Power Corporation

KEXIM, South Korea Export and Import Bank

LNG, liquefied natural gas

LULUCF, land-use, land use change and forestry

MEE, China's Ministry of Ecology and Environment

MEP, China's Ministry of Environmental Protection, restructured to MEE in 2018

METI, Japan's Ministry of Economy, Trade and Industry

MOE, Japan's Ministry of Environment

MOTIE, South Korea's Ministry of Trade, Industry and Energy

MW, megawatt

NEA, China's National Energy Administration

NDC, Nationally Determined Contributions

NDRC, China's National Development and Reform Commission

OECD, Organization for Economic Co-operation and Development

PM, particulate mater

SC, subcritical

TEPCO, Tokyo Electric Power Company

UNFCCC, United Nations Framework Convention on Climate Change

USC, Ultra-supercritical

Preface

The impacts of climate change have been felt by human society. Global temperature has risen 1 ℃ for the past 100 years, and 2017 was the hottest year on record. Impacts from climate change vary by region; some areas suffer from heavy rain and flooding, whilst others face serious drought, heatwaves and wildfires. Hurricanes and typhoons are becoming stronger, causing storms, storm surge and flooding.

East Asia is no exception. In the beginning of July 2018, western Japan experienced the highest levels of precipitation in recorded history. Dikes and dams burst, killing over 200 people. Later the same month, Japan hit its highest ever temperature of 41.1 ℃. Temperatures remained over 35 ℃ for weeks and a number of people were hospitalized due to heatstroke, many of whom later lost their lives.

In South Korea, there were 7,000 more excess deaths in July and August 2018 compared to the previous year, and heatwaves pushed temperatures to 39.6℃ in Seoul, the highest in 111 years. Temperatures in rise twice as quickly as the global average, changing the climate from temperate to subtropical and exacerbating extreme events like floods, storms and droughts. The South Korea Environment Institution estimates that the cost of climate change would be 5.2% of GDP in 2100 if the economy continues to rely on fossil fuels. However, a transition to a low carbon, sustainable society could reduce said costs by one half.

In China, 2017 was an abnormally warm year, with average surface temperatures close to record-breaking. As many as 70 million people were affected by the storms, floods, and geological disasters during the year; estimated direct economic losses exceeded USD 30 billion.

November 2016 saw the enaction of the Paris Agreement, providing for participating countries a framework with which they can mitigate climate change. It sets a target of global average temperature increase “well below 2 ℃ above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5 ℃ above preindustrial level”. The Agreement’s target requires peaking greenhouse gas emissions as soon as possible, eventually achieving zero emissions during the late 21st century.

The transition from fossil fuels to renewable energy and energy-saving technologies is already underway. In Europe, an increasing number of countries have declared their intention to end coal use, the most polluting fossil fuel. Fifty countries and public entities founded the “Power Past Coal Alliance” (PPCA), a network advancing the transition away from coal. However, such a movement is yet to be seen in East Asia.

In this report, members of the East Asia Climate Forum from China, Japan and South Korea introduce current status of coal-fired power plants (CFPPs) and their prospects. All member countries are still heavily dependent on coal. In order to help realize the decarbonized society envisioned by the Paris Agreement, we hope this report could provide a different angle from civil society for a better understanding the issues and general trend of the coal power sector in East Asia, and could contribute to the discussion on a quicker transition to a cleaner energy system.

Summary

An ambitious combatting further global warming requires the current energy system to rapidly decarbonize. The Energy Transition, namely the movement from coal and other conventional energy to renewables, is already underway in the East Asian countries to some extent. However, the differing transition pathways in each country depend on their unique political, socio-economic and environmental circumstances. Coal power remains as a major source of power generation. The following joint report, authored by different institutions from China, Japan, and South Korea, aims to provide an overview of energy and climate policies and analyze the issues surrounding CFPPs in three countries.

Insufficient climate commitment under the Paris Agreement

All three countries submitted their individual National Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, but they are not sufficient enough to achieve the goal of below 2 ℃.

China has committed to peak carbon dioxide emissions by around 2030, making a strong effort to peak early and by 2030, lower carbon dioxide emissions per unit of GDP by 60% to 65% of 2005 levels, enhance the share of non-fossil fuels in primary energy consumption to around 20%, and increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level.

Japan's NDC includes reducing carbon emissions to 26% of 2013 levels by 2030 (18% lower than 1990 levels). This target is based on the country's 2030 energy-mix scenario, which maintains existing industrial and energy structures. The continued increase in the number of CFPPs threatens Japan's already weak 2030 mitigation target.

South Korea has pledged to cut its emissions to 37% below business-as-usual levels by 2030. Although South Korea is a member country of Organization for Economic Co-operation and Development (OECD) and now is the world's 11th largest economy, their GHG emission target is not an absolute reduction target. In addition, their NDC suggests that 26% of its reductions would be domestic, achieving the remaining 11% reductions through international carbon market mechanisms.

Coal still dominates in the current energy mix

Around 60% of **China**'s primary energy comes from coal, down from 70% in 2010. In 2014, the total coal consumption decreased compared to the previous year, surprising policy-makers and researchers who all expected a continuous increase of coal consumption. The main reason behind said decline should be the stringent air pollution policies implemented in 2013 after severe smog episodes during the winters of 2011 and 2012.

The Chinese coal-based thermal power industry is the country's largest coal consumer. In 2015, it consumed 1.96 billion tons of coal, accounting for 49.5% of total Chinese coal consumption. Existing CFPPs number is around 2,500, and the total capacity approximated 970 GW at the end of 2017, around 2% increase compared to 2016.

In **Japan**, there are over 100 CFPPs with capacities ranging from a few MW to over 1,000 MW, and the total capacity is about 45 GW. In 2016, the power generation from CFPPs was 289.8 TWh. Although considering the retirement of CFPPs after 40 years of use, existing plants will remain beyond 2050. Additionally, if CFPP planning and constructions continue, the generation capacity will peak by 2026. Total CFPPs capacity remaining in 2050 is estimated at around 20 GW. Since 2012, there have been about 50 construction plans for the new CFPPs. In detail, 31 of them are large scale plants and 19 are small scale. Already 7 plans were canceled, but 8 have started operating. So far, there are 35 ongoing construction plans.

In **South Korea**, coal is the main driver of carbon dioxide emissions increase over the past two decades. CFPPs are the single largest contributors to their GHGs emissions, accounting for 24% of total emissions in 2012. As of December 2017, 61 units or 13 CFPPs were operating in South Korea, totaling 35,428 MW. In 2017, three old CFPPs (total 525 MW) closed but six plants (total 5,240 MW) began operations. The share of coal in power generation increased from 40% in 2016 to 45% in 2017.

The South Korean government under the previous Park administration announced in early 2013 to double the capacity of CFPPs by 2027 on the sixth *'Basic Plan for Long-term Electricity Supply and Demand (BPE)'*. It planned to increase coal (bituminous) capacity from 23,409 MW in 2012 to 44,669 MW in 2027 by constructing 27 new CFPPs.

After the Presidential election in May 2017, the newly-elected Moon government announced a review of 2 coal-fired plant construction projects which have not gained final approval and cancelled the "Dangjin Eco Power" project in Chungnam Province on the 8th BPE in December 2017. However, coal power capacity is set to increase from 36.8 GW in 2017 to 42 GW in 2022 before decreasing to 39.9 GW in 2030. At the same time, the South Korean government will allow coal's share in electricity production to remain the largest with a 36% stake in 2030, down from 40% in 2016.

Environmental regulation of coal power sector

In **China**, "command and control" is the default policy tool used to control and reduce the emission of pollutants. The governmental regulations are implemented with or without penalties. Although its economic efficiency is problematic, command and control is highly effective when policymakers are serious about addressing pollutions.

China currently adopts administrative interventions on the control of the total sulfur dioxide (SO_2), nitrogen oxides (NO_X), and particulate matter (PM) emissions in thermal power industry. From *'The 11th Five-Year Plan',* China has set energy-saving and emission-reduction targets, including reduction goals for the discharge of major pollutants. China has established detailed rules and operational measures for controlling total pollution in *'Laws on Air Pollution Prevention and Control'*.

Adjusting emission standards of air pollutants for thermal power plants is another effective way of reducing emissions. The first set of standards were created in 1991 and amended in 1996, 2003 and 2011. Due to severe air pollution episodes in 2010, the 2011 revisions tightened the emission limits for PM, SO_2, NO_X and mercury.

Since 2017, an ambitious regional plan has required northern "2+26" cities in the Beijing-Tianjin area to clearly define their individual pollution reduction tasks, largely in the coal and transport sectors. The central government has set specific targets backed up by threats of fines and other punishments.

In **Japan**, one of the main reasons why more than 35 new CFPPs are currently being planned and under construction is insufficient regulation such as weak Environmental Impact Assessment (EIA) rule in Japan. For example, the subject of the EIA for the coal-fired power plants is above 112.5 MW, so the newly construction plans of under 112.5 MW have been significantly increasing. Recently, the government set the rule that the new construction must meet the generation efficiency standard of 42.0% for coal, 50.5% for LNG and 39.0% for petroleum and others. However, since the existing large-scale plants are ultra-supercritical (USC), this would not restrict the new plants: rather, it approves the constructions from the technical aspect.

In addition, there are loopholes as "special provisions". On estimating the efficiency, facilities using byproduct, co-generation and biomass combustion can deduct the applied energy from input of coal. The improvement of the combustion rate of biomass can even allow the high estimation (actually most biomass combustion lower the efficiency). Joint implementation that allows the operators to reach the efficiency target collectively is also permitted.

South Korean President Moon pledged to close 10 old CFPPs by 2022 and review new coal-fired power plant projects. The government then implemented a temporary shutdown of 5 coal-fired power plant for 4 months from March to June in 2018 when air pollution is expected to worsen.

Though the government has implemented the aforementioned pledge on the old CFPPs, it was very unclear about the measurement of 9 new CFPPs with 8,420 MW in total. In 2017, the MOTIE had reviewed the feasibility to switch the fuel type of the 9 new coal-fired power projects to LNG. However, the government only decided to switch only 2 units of coal-fired power plants to LNG while allowing to proceed other 7 units to be built.

Despite a long-term plan to reduce nuclear output, South Korea will add two reactors by 2022 after a public debate in October 2017 in favor of the construction. The government was placed in a difficult situation, pressured to turn away from nuclear and coal while facing fierce opposition from the nuclear industry.

The future of coal and coal-power in Energy Transition

Although three countries currently depend heavily on coal and CFPPs, future directions differ due both to differences in attitude between current administrations as well as respective policy environments.

For many years, as **China**'s economy grew rapidly, leadership focused on maintaining sufficient energy supplies. But the Chinese coal power sector also faces overcapacity, dwindling demand for electricity due to weakened economic growth. Also, a number of structural shifts are taking place. Beijing is looking to continue its economic restructuring and adopt more consumption-led and environmentally sustainable growth, leading to slower oil and coal demand growth but more rapid growth in natural gas and renewable energy consumption. Under the '*The 13th FYP (five-year-plan) on Energy Development',* total coal power capacity should remain below 1,100 GW by 2020; and

after 2020, coal consumption in the Chinese coal power sector should reduce and the long-term declining trend should continue.

The future energy policy in **Japan** would continue as before Fukushima Daiichi nuclear accident, which is to consider both the coal and nuclear as an important base-load electricity source. In 2030 energy mix projected in the *'Long term Energy Supply and Demand Outlook'* in 2015, coal as a base-load power source covers 26% of electricity demand which goes beyond that of renewable energy (22-24%). Along with the liberalization of entry to the electricity retail business, this energy mix figure has been the very root of the increasing number of coal-fired power plant construction plans in Japan and this figure was inherited to the *'The 5th Basic Energy Plan'* adopted by the Japanese government in July 2018.

Due to the strong support from the current **South Korean** government, future trends for the energy portfolio include decreasing the number of nuclear power plants and supporting renewables and liquefied natural gas. Therefore, the current governmental plan is to gradually phase out coal and nuclear, while expanding renewable energy to 20% of power generation by 2030.

Table 1: Summary of policy direction on energy and climate in three East Asian countries

	China	**Japan**	**South Korea**
Political attitude on energy transition in general	**Progressive**	Conservative	Progressive
Decision-making process	**Close, Top-down**	Close, mixture of Top-down and Bottom-up	Open, Participatory
Coal-fired power generation	**Reduction**	Increase	Reduction
Implementation	**Strong**	Challenging	Challenging
Renewable energy	**Supportive**	Relatively supportive	Relatively supportive

Environmental tax on coal	**Environmental Protection Tax**	Tax for Climate Change Mitigation (carbon tax)	Coal consumption tax
Carbon Market	**Establishing nationwide ETS (emission trading system)** **Seven pilot ETSs**	No nationwide ETS, Two metropolitan ETS	Nationwide ETS

Role of civil society in energy transition

Civil society has been working hard for a just energy transition; however, in each country, civil society has its own strength and weakness and is facing many issues.

Due to its relatively short history, in general, civil society in **China** is less active than that of the other two countries. However, environmental NGOs are one of the largest NGO groups in China and play a significant role in addressing the nation's environmental concerns. For example, in 2013, some fifty Chinese environmental NGOs led by the Greenovation Hub sent an open appeal letter to the China Banking Regulatory Commission (CBRC), calling upon the commission to reject the establishment of the China Coal Bank by 15 coal firms. Although the bank was not established due on suspicions of fraud, the campaign is an example of Chinese NGOs' coordinated work against coal. There were protests against the construction of coal-powered plants in southern provinces such as Hainan and Guangdong. Also, in the past several years, NGOs handled bulk of the legal cases fighting against environmental pollution.

In 2013, in response to the "coal plan boom" in **Japan**, Kiko Network, a Japanese climate NGO, established the land-mark website "Don't Go Back to the Sekitan (coal in Japanese)! (sekitan.jp/en)" in order to provide a platform for coal power issues in Japan. Moreover, in 2014, Kiko Network collected new construction plans and uploaded each plan with corresponding information to its "Japan Coal Plant Tracker". During periods of EIA public comment, Kiko Network has submitted their opinions and raised views from the perspective of civil society, while also publishing its own. In 2017, the existing CFPPs lists and maps were added in the "Japan Coal Plant Tracker". This gave a great opportunity to form the local movement and the rise of insistence on national policy.

There are several local-led movements. For example, in 2016 autumn, in Sendai city of Miyagi prefecture, a group for protesting the construction of two CFPPs in Sendai Bay was established. This group has been insisting the business operators to conduct independent assessments and to hold an explanatory meeting for local residents during the planning stages. However, the business operators did not respond, leading to a larger scale protest which included Prefectural council. In September 2017, local residents brought this case to the court for injunction. The trial is still ongoing.

The **South Korea** Federation for Environmental Movements (KFEM) and Greenpeace are groups which have campaigned nationally on coal in South Korea. Civil society groups prioritized suspending the expansion of new coal-fired plants advocated by the government. KFEM had worked on coal with local groups for years and Greenpeace campaigned on coal by publishing a study on premature death from coal in 2015. In 2016, the movement to take South Korea beyond coal grew powerfully. As public concern over air pollution increased, the government's plan to build more CFPPs angered a majority of Koreans. Local people held a rally and hunger strike in July 2016 to demand the government to cancel the new coal plant in Dangjin, Chungnam Province. The Mayor of Dangjin joined the strike and 19 civil society organizations published a joint statement in support, which successfully delayed the approval of the project.

The way toward a Just Energy Transition

In **China**, air pollution and structural changes in modern industry have played big role in reducing the consumption of coal. Despite of the high concentration of the air pollutants such as $PM_{2.5}$, stringent command and control measures have brought noticeable improvements of air quality in the targeted areas. At the same time, people and companies have greatly invested in renewable energies. The concern around this rapid transition is how to make it more just and considerate of underprivileged groups and the affected industries.

Japanese civil society has been trying hard to change the direction of government policy and raise awareness of the seriousness of the climate change. In addition, the cost of the renewable energy has become more competitive with conventional energy. However, the pace for the energy transition continues to be slow under the current regime. That said, business such as banks are more aware of the risk of investing in coal-related projects. However, efforts remain inadequate. Beyond protests by civil society groups, more external pressure, such as more specific criticism on the energy policy and inadequate climate target of Japan from the international society.

As for **South Korea**, newly-elected President Moon seems quite defiant on energy transition. Civil society is also very active and continues to facilitate the transition. Air pollution and nuclear safety will remain as a key concern of the general public. Although the South Korean carbon market is not adequately stringent, as the first economy-wide ETS in Asia, it will give positive pressure to other Asian countries such as Japan. Vested interest groups will continue to obstruct to the transition, leading to a harsh political fight on energy policy in the future.

Across the three countries, governmental supports on the export of the CFPPs of great concern to the international community. Although "domestic" energy transition underway in China and South Korea, the governments including Japanese government heavily support the export of the coal-fired power technology to developing countries, leading to international criticism. Despite official pledges to stop the climate change, Asian governments contradict their words with their actions. The three countries need to consider how to act as role models for the region and how to lead the Energy Transition not only within their own borders but within a larger geographical context.

Chapter 1 Background Climate and Energy Policy

According to the Environmental Justice Atlas, major environmental conflicts in East Asia countries are often related to fossil fuels, climate justice, nuclear energy, and industrial/utilities conflicts as shown in **Figure 1**. Climate change exacerbates environmental conflicts and require all countries to transition quicker from fossil fuels-based energy system to a more renewables-based system. Therefore, it is necessary to understand the coal power sector in China, Japan and South Korea, to find the solutions on how to reduce associated environmental conflicts maximize co-benefits from each country's climate and energy policy.

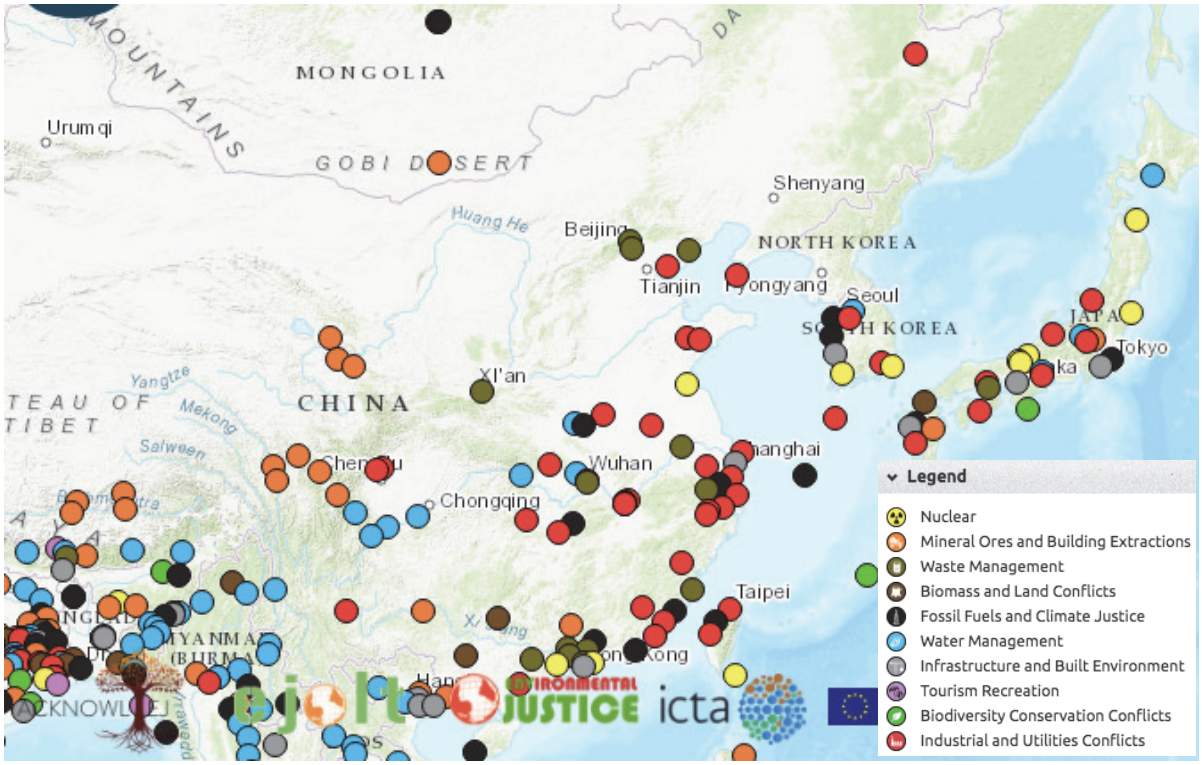

Figure 1: Environmental conflicts in East Asia;

Source: http://ejatlas.org (cases of environmental conflicts by categories)

In the past, all three countries' efforts in combatting climate change have brought about renewable technology development, air pollution reduction, energy security/accessibility improvement, and job creation. Some may argue that the transition is not quick enough when millions of people are still experiencing unhealthy air in big cities and carbon emissions continue to grow. In this transformative and long process, civil society could and should play an important role in safeguarding the social, health and environmental impacts of energy transition.

In this context, discussing the experience and lessons from coal power sector in China, Japan and South Korea would contribute not only to a sustainable climate policy but also to the reduction of regional environmental conflicts. However, collaborations between civil society organizations in the three countries on these two issues are still limited. We hope that this report could bring more stakeholders into the discussion, and that leading civil society organizations in the field play a

dynamic and productive part in promoting a transparent, inclusive, and reasonable policy discussions on climate change and energy transition issues in each country and beyond.

Climate Policy

China: More ambitious targets needed

China's climate policy has evolved over the past two decades. Initially, China emphasized its right to economic development and common but differentiated responsibilities (CBDR) in the global climate negotiation. Then, China aimed to capitalize on its economic development, supporting GDP growth over carbon emission reduction. Now, China has been implementing more ambitious climate policy since the 2015 Paris Climate Talks, and increasingly considers addressing climate change beneficial to national development. In 2016 June, China submitted the first Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC). By 2030, they pledge to:

- Peak carbon dioxide emissions by around 2030 and make a strong effort to peak early
- Lower carbon dioxide emissions per unit of GDP to 60% to 65% of 2005 levels
- Increase the share of non-fossil fuels in primary energy consumption to around 20%
- Increase the forest stock volume by around 4.5 billion cubic meters compared to 2005 levels

To realize their carbon emission reduction goals, carbon intensity goals have been embedded into the national '*Five-Year Plan (FYP)'* and implementation responsibilities have been distributed to low-level government and various industrial facilities. However, some argue that the Chinese targets on intensity reduction is relatively conservative and not strong enough to meet the global 2 °C target.

The above typical "command-and-control" approach has long been applied, but recently, the Chinese government has implemented more market-based and voluntary approaches. First, in 2017, after five years of carbon market pilot projects across the country, China announced that it would establish its national carbon market in the coming years. The power sector is currently the only sector covered by the scheme. However, the market is in its preparatory stages and may not go into full operation until 2020. Second, international cooperation and demand for shifting development models in cities have generated voluntary initiatives. Many cities, particularly those in eastern developed regions and provinces have joined a network of carbon emission peaking cities and work with different actors to create low carbon development strategies. These cities may get peak their carbon emission in 2020-2025, earlier than the national goal.

Japan: Depending more on voluntary efforts under the loose target

In 1998, Japan introduced the policy framework for climate change, the '*Global Warming Countermeasure Promotion Law'*. It was revised in 2015 to require businesses to publicly calculate, record, and disclose their GHG emissions. Additionally, law encourages the formulation of action plans in local government and the promotion of public awareness. However, there is essentially no

obligation for the business operators to reduce GHG emissions. Since emissions reduction is not legally binding, its implementation depends solely on voluntary action.

As shown in **Figure 2**, Japan's NDC under the Paris Agreement is to reduce the GHG emissions by 26% of the 2013 level until 2030 (25.4% reduction compared to 2005 level). This target is derived from Japan's 2030 energy scenario, which means it inherits the existing industrial and energy structures.

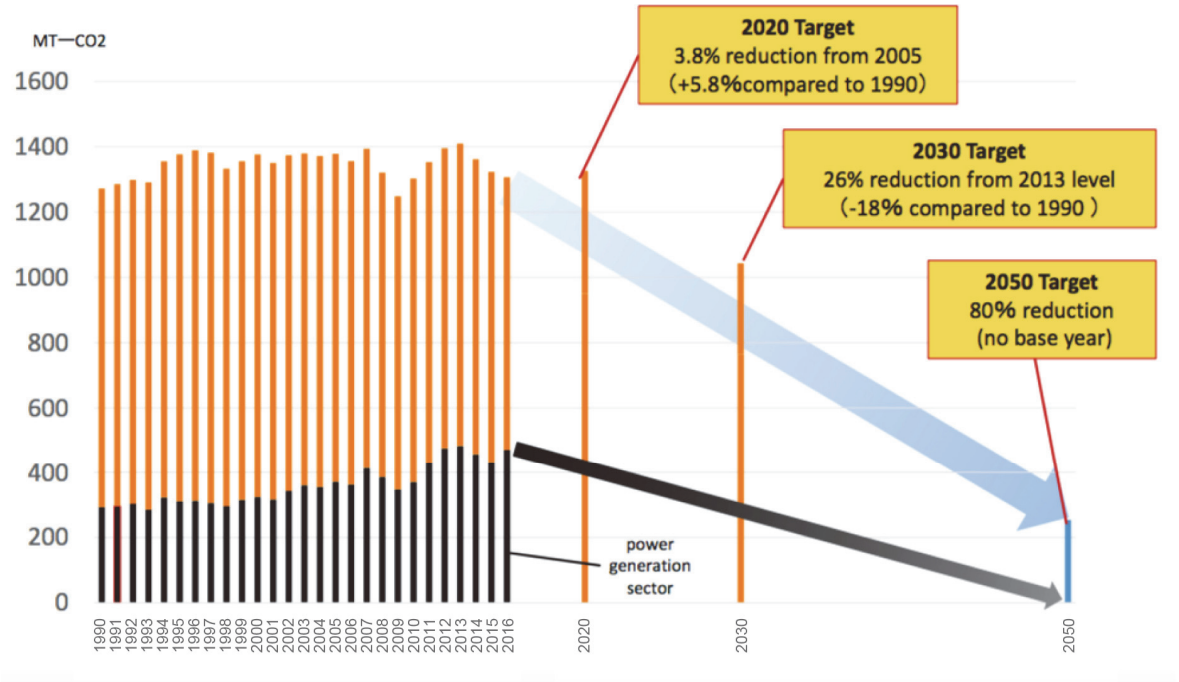

Figure 2: Japan's GHG emissions reduction target
Source: Kiko Network's analysis

South Korea: Targets getting weaker and seen as inadequate

South Korea announced "Low Carbon and Green Growth" as the new key national strategy in 2009 and pledged internationally to cut its greenhouse gas emissions by 30% below business as usual by 2020. Business as usual (BAU) projections from the Third National Communication would have resulted in emissions of 543 Mt-CO_2e in 2020 excluding land-use, land use change and forestry (LULUCF). This represents an increase of 84% in GHGs from 1990 emissions levels.

However, South Korea has recently replaced the 2020 pledge by the weaker 2030 NDC target in its updated '*Green Growth Act'.* Although the Copenhagen pledge has not officially been withdrawn, it is no longer actively pursued.

South Korea's NDC include cutting its emissions by 37% below business-as-usual (or 18% below 2010 level) by 2030. The pledge would have resulted in emissions of 536 Mt-CO_2e in 2030 excluding LULUCF. The NDC also states that only 25.7% reductions would be domestic and that the remaining 11.3% would be achieved through international market mechanisms. In 2018 July, the government

amended the domestic target to reduce 25.7% to 32.5% below business-as-usual but the remaining part still includes forestry and international carbon market.

According to one estimate, the NDC seems to put the country's target based on a 2 °C scenario[1]. Besides, other estimates have also rated South Korea's target as "inadequate", for example, the Climate Action Tracker considers the target as inadequate based on several criteria for determining a "fair share" of global responsibility and capability for tackling climate change[2].

Energy Policy

China: To be greener and more transparent

Combined with the national strategy of improving ambient air quality, China's national goals, to a large extent, justify ongoing efforts to reduce coal consumption and support the growth of natural gas and renewable energy. The National Energy Administration (NEA) released two action plans in 2014 and 2015. The plans require the adoption of high-efficiency, low carbon advanced coal technologies and promote the development of the CCS (carbon capture and storage) for coal power. However, national actions that cut the coal use for better air quality nationwide seems to have delayed the CCS development in China's policy agenda.

The first action plan is '*Energy Development Strategic Action Plan (2014-2020)',* which defines its mission as "Saving, Clean, Safety" and its strategy as "Priorities of energy conservation, green low-carbon, domestic-situation-based, and innovation-driven".

The second action plan is the '*Energy Regulation Action Plan (2014-2018)',* which aims to establish a transparent and efficient energy regulatory system. Furthermore, China has been experiencing a new round of electricity sector reform since 2015, which aims to bring competition into the electricity transmission sector and build up a competitive power market from generation to delivery. The reform will create more room for renewable energy growth and support the energy transition in the long term.

Japan: Energy security and low price are priorities

After the accident at the Tokyo Electric Power Company (TEPCO)'s Fukushima No.1 nuclear power plant, Japan's 2014 national 'Strategic *Energy Plan'* has been revised which positions coal as "an important base-load electricity source" alongside nuclear power. Although the plan admits that coal "emits a large amount of greenhouse gas", it states that coal "involves the lowest geopolitical risk and has the lowest price per unit of heat energy among all fossil fuels. It is an energy source that we should use while implementing the environmental load through the utilization of highly efficient coal thermal power generation technology, etc."

[1] GECO2015. Global Energy and Climate Outlook. Road to Paris. Assessment of Low Emission Levels under World Action Integrating National Contributions. URL: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/geco2015-global-energy-and-climate-outlook-road-paris-assessment-low-emission-levels-under

[2] Climate change tracker, South Korea Country Summary. URL: http://climateactiontracker.org/countries/southkorea.html

In the *'Long Term Energy Supply and Demand Outlook'* decided in 2015 as illustrated in **Figure 3**, coal as a base-load electricity source is set to cover 26% of domestic electricity demand which exceeds that of renewable energy (22-24%). This provides the government's authorization in increasing numbers of coal-fired power plant construction projects in Japan.

The government revised the *'Strategic Energy Plan'* in July 2018. However, the newly revised *Plan* follows its predecessor; coal remains as "an important base load power source". Subsequent public comments submitted by citizens and environmental NGOs criticized the revision.

On the other hand, the electric utility industry announced their standard emission factor set at 370 g-CO_2/kWh. There has been, however, no specific measure taken on any power plants yet, no distribution of the responsibility, and no penalty specifications for not achieving the standard.

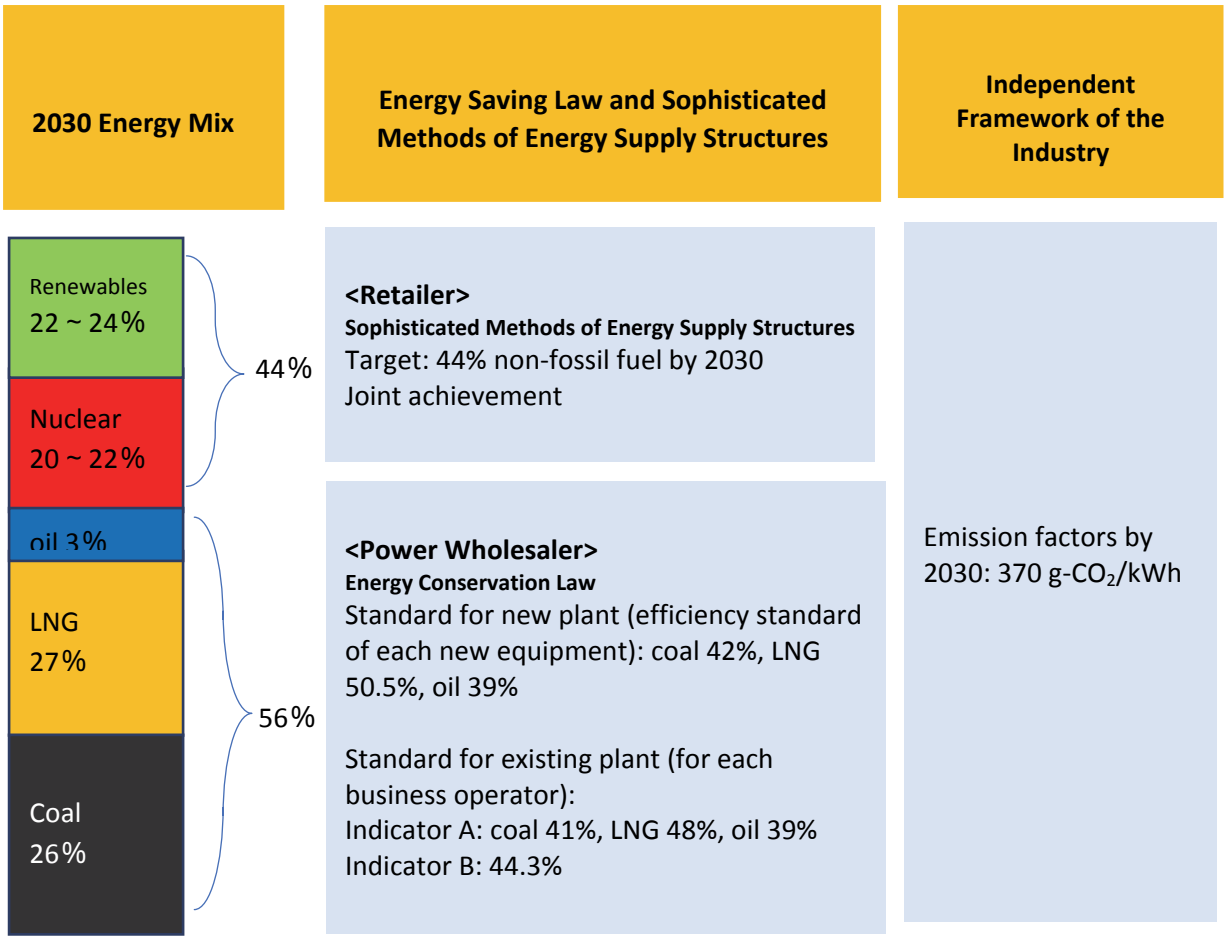

Figure 3: Existing policies regarding coal power
Source: Kiko Network's Analysis

South Korea: Coal and nuclear still dominating

In early 2013, The South Korean government announced its intention to double the capacity of coal power by 2027 in the 6th '*Basic Plan for Long-term Electricity Supply and Demand (BPE)'.* The BPE is a 15-year biennially reviewed plan prepared by MOTIE. The plan forecasted that national power demand would increase by an average of 2.2% per year over a 15-year period, justifying a large-scale expansion of coal and nuclear power. Consequently, the plan planned to increase the country's coal (bituminous) capacity from 23,409MW in 2012 to 44,669 MW in 2027 by constructing 27 new units of CFPPs[3].

The expansion of CFPPs has made it impossible for South Korea to meet its climate commitments. According to the National Assembly Budget Office's report, as the capacity of CFPPs in 2013 is planned to increase 85% by 2021, "under the assumption of conservative technology adoption it would only be possible to reduce GHG emission by 3% below the BAU projection and its associated cost is estimated to be 4 billion USD" (emphasis added). It thus raised a concern that "it is expected that meeting the emissions reduction target would not be feasible if we allow the CFPPs to expand despite adding additional cost."

The government announced to stop four previously planned CFPPs at the start of the 7th BPE in 2015 in an apparent effort to reduce carbon emissions. However, it had been suggested that cancellation of the projects is mainly due to local opposition and issues with power grid connection.

Despite the long-term plan to reduce nuclear power output, South Korea will add two reactors by 2022 as a result of a public debate in October 2017, with most candidates supporting the reactors' construction. The government has placed itself in a difficult situation to turn away from both nuclear power and coal because it faces fierce opposition from the nuclear industry.

On the other side, renewable energy is gaining momentum as the government pledges to increase the renewable power percentage up to 20% by 2030[4]. The 3rd *"National Energy Master Plan"* is supposed to be established within 2018 in order to accommodate this change.

[3] 15 units of coal plants were under construction and 12 units were newly planned on the 6th BPE. URL: https://www.kpx.or.kr/eng/downloadBbsFile.do?atchmnflNo=23330

[4] South Korean government releases draft of plans to increase renewable energy use. URL: http://english.hani.co.kr/arti/english_edition/e_national/825098.html

Chapter 2 Current Status of Coal-fired Power Plants

Past and Existing Domestic Coal-fired Power Plants

China: Small CFPPs gone, large CFPPs remain

The Chinese coal-based thermal power industry is the country's largest coal consumer. In 2015, the total coal consumption from the Chinese coal power sector amounts to around 1.96 billion tons[5] and accounts for 49.5% of total Chinese coal consumption.

The total number of existing CFPPs is around 2,500, and according to the latest figure from the National Energy Administration (NEA), the total capacity of CFPPs fleet was 963 GW at the end of September 2017[6], an approximately 2% increase since to 2016.

As the main contributor to energy-related greenhouse gas emissions, CO_2 emissions from coal consumption reached around 7 billion tons in 2014, accounting for about 70% of China's carbon emissions and 55%-60% of China's greenhouse gas emissions[7]. In November 2016, the State Council issued the '*The 13th Five-Year-Plan on Control of Greenhouse Gas Emissions Program*', for the first time clearly demanding that large-scale power corporations should limit their unit carbon emission of power supply below 550 g-CO_2/kWh by the end of 2020[8].

Since 2010, the Chinese government has tightened the environmental regulation on CFPPs and has decommissioned small scale CFPPs. The capacity of newly built CFPPs typically exceed 300 MW. This means large CFPPs have dominated the coal power fleet in China. By 2015 the number of CFPP units with 1,000 MW capacity or above was counted 80, and the CFPP units with capacity of between 600 MW and 1,000 MW accounted for over 40% of the total fleet (895 GW)[9].

Japan: Existing and Planned CFPPs defying the Paris Agreement

Today, there are more than 100 CFPPs with capacity from a few kW to 1GW in Japan. The total generation capacity is estimated at around 45 GW as of April 2018. And the total generated electricity from CFPPs increased to 289.8 TWh in 2016.

[5] Calculated based on the figure in '2015 coal consumption in the power industry reached over 1.4 billion tons coal equivalent.URL: http://www.china5e.com/news/news-169411-1.html (in Chinese), Note: 1 ton of raw coal equals to 0.7143 tons coal equivalent (tce)
[6] 'In the first three quarters, the country has eliminated about 2.5 GW of coal-fired power units'. URL: http://www.nea.gov.cn/2017-10/31/c_136717010.htm
[7] Climate change and total coal consumption control, NRDC. URL: http://www.nrdc.cn/coalcap/console/Public/Uploads/2015/06/10/Climate%20Report.pdf (in Chinese)
[8] The 13th FYP on Control of Greenhouse Gas Emissions Programme. State Council. URL: http://www.gov.cn/zhengce/content/2016-11/04/content_5128619.htm (in Chinese)
[9] CEC launches the Annual Report on China Electricity Development 2016. URL: http://www.cec.org.cn/guihuayutongji/gongzuodongtai/2016-08-24/157409.html (in Chinese)

The majority of existing thermal plants are operated by former general electric utilities and J-POWER. In addition to these, a 1995 amendment to the "*Electric Utility Industry Law"* permitted IPPs (Independent Power Producers), which led steel and chemical industries to build and operate their own power generation facilities.

The number of CFPPs has consistently increased since 1960s. Although considering of future retirement of the CFPPs older than 40 years, the total capacity will remain steady until 2040, as shown in **Figure 4**. Additionally, according to Kiko Network's estimate, if construction continues, generation capacity will peak at 2026. In 2050, there will still be about 20 GW of coal power capacity, clearly defying the Paris Agreement target.

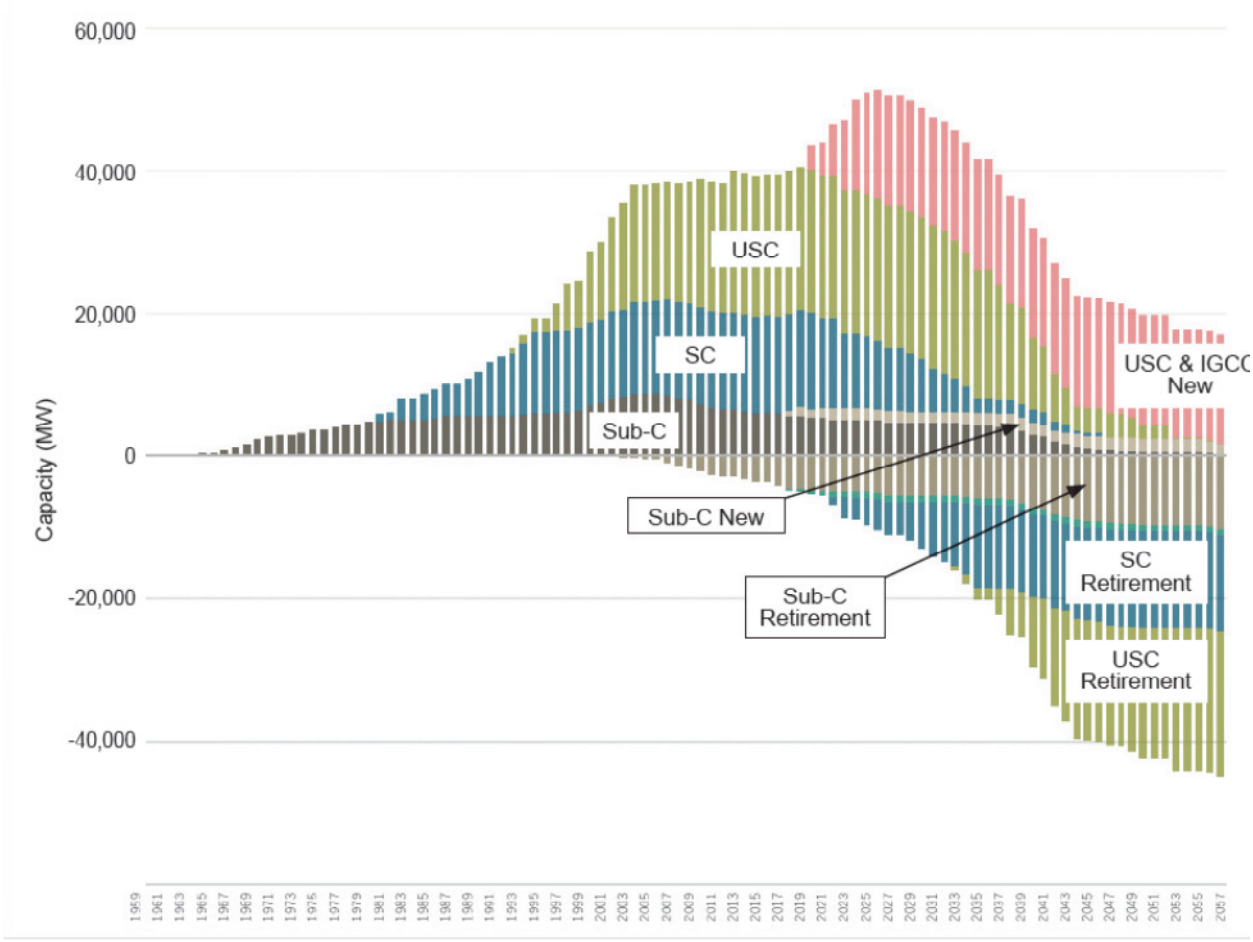

Figure 4: Existing and planned coal-fired power capacity in Japan
Source: Kiko Network's Analysis

Full liberalization of entry to electricity retail business

After the accident at TEPCO's Fukushima NO.1 nuclear power plant in 2011, Japan has been promoting the electricity system reform. Along with it, private investments have had full access to the electricity retail business, marking the abolition of regional monopolies from April 2016 onwards.

Prior to liberalization, public electricity companies dominated power generation and electricity retail in 10 divided areas. Liberalization allows new electricity investments to enter the market, stimulating competition. As electricity companies tend to aim at developing their own power sources with financially feasible means, liberalization has caused an increase in CFPP constructions in Japan.

After the nuclear reactor accident, citizens expected a shift from massive concentrated power generating systems, such as nuclear power to decentralized, renewable energy generation systems.

South Korea: Concentrated CFPPs burning imported coal

South Korea ranked 7th in the world for global carbon dioxide emissions and 12th in total GHG emissions. accounting for 1.8 percent of global GHG emissions in 2013. While emissions from fossil fuel combustion in 2012 increased by 158% since 1990, emissions from coal increased by 237% during the same period. CFPPs are the single largest contributors to their GHG emissions, accounting for 24% of total emissions in 2012 according to the country's "2015 National Greenhouse Gas Inventory Report".

As of December 2017, 61 units in 13 CFPPS are operational in South Korea, with capacity of 35,428 MW. Throughout 2017, three old CFPPs (525 MW in total) were closed but was surpassed by six new CFPPs (5,240 MW in total). Coal share of power generation increased from 40% in 2016 to 45% in 2017.

Around half of the country's CFPPS capacity is concentrated in Chungnam Province, equaling 30 units totaling 51.3% (18,140 MW) of the total capacity. Three of these plants are among top five largest CFPPs in the world. Taean, Dangjin and Boryeong plants together have 10 units which outputs over 6,000MW each, their capacities are close to that of the Datang Tuoketuo plant in China, according to Coal Swarm (with 4,000MW of Boryeong and 2,000MW of Shin-Boryeong added)[10].

All existing CFPPs are operated by five big power companies, subsidiaries of the state-owned KEPCO (Korea Electric Power Corporation) except the Bukpyeong plant, which belongs to a private energy company. As most CFPPs are operated by public power companies, they are generally influenced by the MOTIE policy in terms of pollution control, information disclosure policy and are under the Parliamentary inspection.

In summary, power production and the share of coal-fired power has generally increased in South Korea. Coal has always been the largest source for power generation which accounts for 40% of country's power generation. Coal consumption for power generation and electricity production has been increasing for decades. The major type of coal is bituminous which is mostly imported from Indonesia, Australia and Russia.

[10] Top ten largest coal plants in the world. URL: https://www.sourcewatch.org/index.php/Top_ten_largest_coal_plants_in_the_world

Overseas Investment on Coal Power

China: Expanding along the "Belt and Road'

As China tightens its environmental restrictions and regulations, the pace of domestic CFPP construction has dwindled. However, the construction of CFPPs abroad has been growing. China exported more manufactured boilers, steam turbines, and other coal power technologies than any other country in the world[11]. As China has become the world's largest market in building and financing renewable energy projects, its involvement in coal and gas construction also grows.

The construction of a future market for Chinese coal exports is characterized by China's exports of coal-related jobs, industries building, and CFPPs investments. In the sub-Sahara region, China's energy companies comprise of almost half of new coal power and over half of the 20 biggest coal plant developers globally[12]. Shanghai Electric Group, one of the country's largest electrical equipment makers, has announced projects to build coal power plants in Egypt, Pakistan, and Iran with a total capacity of 6,285 MW, around 10 times of the 660 MW it plans to build domestically[13]. Chinese expansion in this sector is due to both strong infrastructure demand in developing countries and a sharp decline in coal financing by international finance institutions such as the World Bank and Asian Development Bank. Furthermore, China's infrastructure project, the "Belt and Road Initiative", specifically promotes the construction of power plants abroad. The coal projects involving China's contribution is shown in **Figure 5**.

[11] China's Global Ambitions, Cash and Strings Attached. The New York Times. URL: https://www.nytimes.com/2015/07/26/business/international/chinas-global-ambitions-with-loans-and-strings-attached.html

[12] China Exports Coal Energy to Africa, Stanford University. URL: http://large.stanford.edu/courses/2017/ph240/li1/

[13] China Races to Build up Global Coal Generation. URL: http://www.theenergytimes.com/resources/china-races-build-global-coal-generation

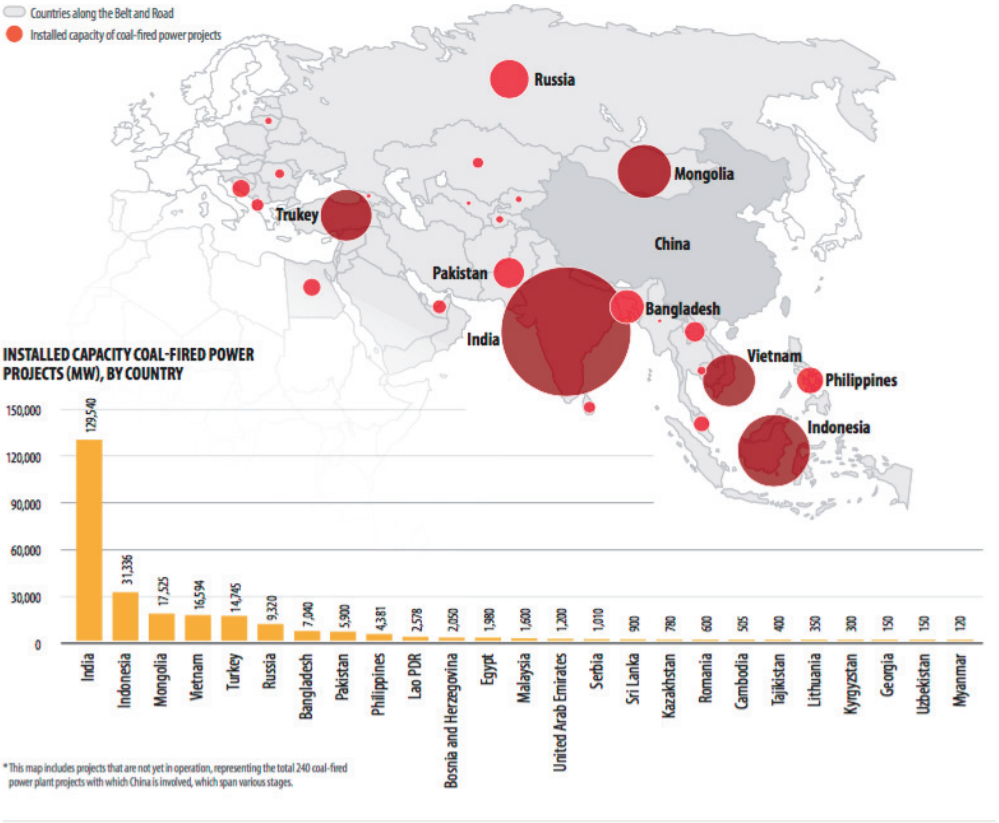

Figure 5: Belt and Road Coal-fired Power Projects with Chinese Involvement

Source: China's Involvement in Coal-Fired Power Projects along the "Belt and Road", GEI China.

There are three types of Chinese firms active in China's overseas coal power business: 1) Major state-owned power giants that control Chinese electricity generation, transmission, distribution and sale of power; 2) Relatively smaller power corporations; and 3) Equipment manufacturers in the power business [14].

Impact-wise, a new CFPP abroad is greater than a domestic CFPP. The environmental regulations for coal-power sector tend to be relatively low or none in some less-developed countries. In the case of Egypt and Malawi, coal projects by Chinese companies would increase dramatically from zero[15]. However, building new CFPPs in countries previously lacking them may create coal dependencies for years to come, shifting the course of their national energy policies for decades. In addition, the new CFPPs would cause air pollution issues in those countries as well as jeopardize their NDCs when considering the increasing carbon dioxide emissions.

With China being at the forefront of the renewable energy expansion, the Chinese power sector must consider how to mitigate the environmental and social impacts associated with their overseas

[14] China's Expanding Overseas Coal Power Industry: New Strategic Opportunities, Commercial Risks, Climate Challenges and Geopolitical Implications. King's College London. URL: https://www.kcl.ac.uk/sspp/departments/warstudies/research/groups/eucers/pubs/strategy-paper-11.pdf

[15] As Beijing Joins Climate Fight, Chinese Companies Build Coal Plants. The New York Times. URL: https://www.nytimes.com/2017/07/01/climate/china-energy-companies-coal-plants-climate-change.html

energy development projects. China meets its climate commitment under the Paris Agreement within its border, but the coal consumption and associated carbon emissions increases in other countries could put the Paris Agreement at greater risk. China may instead export more renewable energy into electricity-hunger countries.

Japan: Worst performance among G7

Although most governments have stopped or will stop financing fossil fuels, especially coal, and shifted to clean energy projects, Japan is one of the county continuing to provide billions for fossil fuels. According to the report "Financing: Climate Disaster (October 2017)"[16], Japan is the worst offender, providing over USD 13 the worst offender, providing over USD 13 billion annually to fossil fuels. In order to achieve the 2 ℃ target of the Paris Agreement, at least OECD countries should decarbonize its energy sources by shifting to renewable quickly. However, Japan is still financing coal plants overseas, especially in South and Southeast Asia, with violating the OECD agreement. For coal project the bulk of public financing come from the governments mainly through the Japan Bank for International Cooperation (JBIC) and the Nippon Export and Investment Insurance (NEXI) and Japanese government continues to insist exporting high-efficient "clean-coal" technology to developing counties is contributing to the sustainable growth of the host countries' economic growth and to protect the environment. This is neither consistent with the Paris Agreement nor ignoring the reality not construction any new coal plant would be the best option for the future. Financing for coal from 2013 to 2016 was about USD 15 billion while financing for renewables was about USD 3 billion and it is clear JBIC provide staggering amount of money on coal.

In addition to the JBIC and NEXI, other bilateral aid such as the Japanese International Cooperation Agency (JICA) provides loans, grants, technical assistance and other supports. There are many Japanese-supported coal project in Indonesia, Vietnam, India, Philippines and other countries. These coal projects include project finance, engineering procurement, and construction/energy selling contracts that profit various Japanese companies such as Marubeni, Toshiba, Mitsubishi Hitachi Power Systems (MHPS). Japanese governmental policy fueled by the Japanese Ministry of Economy, Trade, and Industry and *Keidanren* (the Japanese Business Federation representing Japanese industries) aggressively promotes coal development in those developing countries. It seems Japanese government indicates a toughening stance against global decarbonizing movement.

Such a stance makes Japan remains in last place in the "E3G Score Card", for the past three years[17], among G7 countries as actively seeking to build new coal power plants domestically and internationally. Again, Japan is the only one country that is still pursuing coal power among G7 and Japanese government should understand being the last position in this ranking reflects its international reputation on climate change.

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[16] FINANCING CLIMATE DISASTER: How Export Credit Agencies Are a Boon for Oil and Gas. URL: http://priceofoil.org/content/uploads/2017/10/Financing-Climate-Disaster.pdf

[17] G7 COAL SCORECARD – FOURTH EDITION DECISION TIME FOR COAL IN GERMANY. URL: https://www.e3g.org/docs/G7_Coal_Scorecard_2018_-_Fourth_Edition_-_Decision_time_for_coal_in_Germany.pdf

South Korea: Risky financing with less investment

South Korea is the third largest coal financier among OECD countries. South Korea provided 2 billion USD for overseas financing on coal projects from 2013 to 2016 following Japan (USD 10 billion) and Germany (USD 4 billion)[18]. Note that the South Korea has also provided USD 0.5 billion for renewable energy projects like solar and wind, four times less than its financing for coal projects. One of the CFPPs that South Korea supported was the Mundra Ultra Mega Power Project in India, as it was responsible for the majority of local air pollution, carbon emissions, and severely negative health impacts[19]. In 2015, the OECD Export Credit Group decided to restrict its member's support of coal power. The restrictions went into effect in January 2017, prohibiting OECD ECAs from supporting CFPPs unless they use ultra-supercritical (USC) technology or focus on smaller plants in the poorest countries.

Export credit agencies (ECAs) are the key players to provide public financing on overseas coal projects. ECAs are public agencies who also provides government-backed loans, guarantees, credits and insurance to private corporations from their home countries. For example, the Korea Export and Import Bank (KEXIM) and K-Sure are the key South Korean ECAs who have supported the export of CFPP projects in developing countries such as Indonesia and Vietnam. Already in 2016, the government announced that it would not build any new CFPPs (though the coal capacity would increase in the short term) domestically, instead increasing the capacities of existing plants. Since the international coal investment restrictions started their effect last year, this shift in policy represents an improvement. However, since the international coal financing restrictions from OECD have been placed on South Korean ECAs' support for CFPPs, South Korea has refused to phase out financing support on overseas coal power plant despite violating international rules.

KEXIM and K-Sure have provided nearly USD 1 billion by supporting two CFPPs while considering another seven. These nine CFPPs for a total of over 7,200 MW could potentially emit up to 43.8 million tons CO_2 every year. And even recently, KEXIM has agreed to support the Nghi Son-2 power plant in Vietnam, a violation to the OECD restriction because the plant uses supercritical (not ultra-supercritical) technology and is higher than 500 MW[20].

Application of CCS and IGCC Technology

China: Cautious planning, generally positive

CCS and IGCC are both in the demonstration stage in China. Since the early 2000s, there has been high-level governmental policy support such as the FYPs in energy and power industry on R & D, categorizing them as "clean coal technologies". China's first large-scale demonstration IGCC plant (250 MW IGCC plant with CCS) was built in Tianjin by China Huaneng Group and began operations in

[18] NRDC, Power Shift: New Report on International Coal vs. RE Finance, December 2017. URL: https://www.nrdc.org/experts/han-chen/power-shift-new-report-international-coal-vs-re-finance

[19] WWF, OCI, Rich country support for overseas coal projects causes tens of billions in damage – new analysis, 2015. URL: http://wwf.panda.org/?256098/Coal-report

[20] Friends of the Earth US, WWF, NRDC, to be published in 2018. URL pending.

late 2012 with support from ADB; it is also the first IGCC power plant in the Asia and Pacific region[21]. IGCC plants are not considered for a wider deployment since the technology is still stagnant at the demonstration stage and contains rather high uncertainties.

Although the government sees CCS and IGCC as a clean way of burning coal, the attitude toward future development pace is cautious. Concerns stem from the technology's maturity and cost, as well as the worrying prospect of coal power. Various stakeholders have different attitudes and levels of involvement toward CCS. Shown in the graph below, three out of four surveyed international environmental NGOs were supportive, while industry and think-tanks are mostly positive toward CCS.

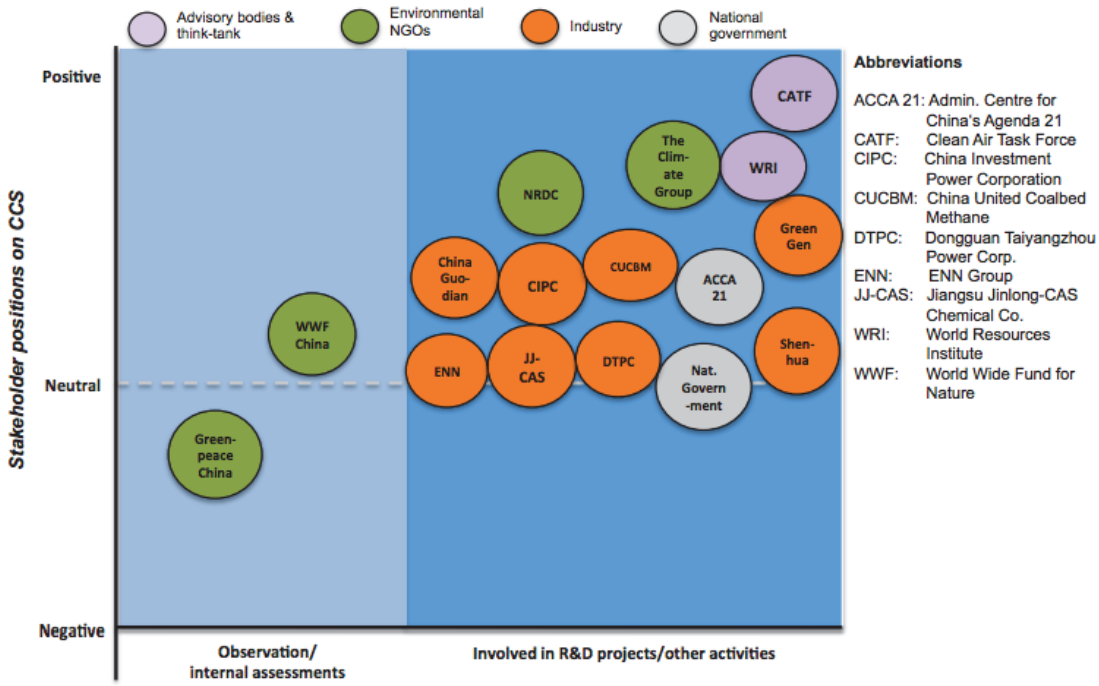

Figure 6: Various stakeholders' attitudes toward CCS

Source: Prospects of Carbon Capture and Storage (CCS) in China's Power Sector. Wuppertal Institute.

Japan: IGCC supported by Fukushima reconstruction budget

Ministry of Economy, Trade and Industry (METI) released *'The Technology Road Map for Next-Generation Coal Power Plants'* in 2016. This road map has been based on the assumption that "the Paris Agreement reconfirmed that next-generation coal power plants should be developed" which clearly misperceived the Agreement. In addition, the concept of this road map completely ignores the international trend toward decarbonization. Japanese government uses this as a guidepost to develop new technologies for coal power generation such as A-USC, IGCC and IGFC (Integrated Coal

[21] Completion Report: Tianjin Integrated Gasification Combined Cycle Power Plant Project. URL: https://www.adb.org/sites/default/files/project-documents/42117/42117-013-pcr-en.pdf

Gasification Fuel Cell Combined Cycle) in the period from 2020 to 2025. However, even “the most efficient” IGFC produces 590 g-CO_2/kWh (while existing natural gas power plant emits approximately 330 g-CO_2/kWh). The technologies such as CCUS (Carbon Capture, Utilization and Storage) and hydrogen power generation could represent the last trump card to cut CO_2 emissions to nearly zero, but concrete strategy how to reduce greenhouse gas emission is not showed at all. Therefore, the development of those technologies is not only the best solution but also an opportunity to increase CO_2 emissions in the wrong conditions.

Consortium of Tokyo Electric Power Company (TEPCO) and other 4 companies is planning to construct two IGCC plants, Nakoso Power Plant (540 MW) and Hirono Power Plants (540 MW), in Fukushima. These will be built in same sites of each plant. In April 2013, Joban Joint Power Company started commercial operation of Nakoso Power Station NO. 10 unit (250 MW), which was the first Japanese IGCC power plant. In the other hands, two newer power plants are considered “Experimental” unites due to those size, in the 500 MW class IGCC. These construction plan is financially supported by Fukushima reconstruction budget. According to the EIA of these IGCC plans, the CO_2 emission intensity is 652 g-CO_2/kWh, which is less than the average CFPP’s emission so far but it does not reach the target of 370 g-CO_2/kWh by the electric power industry.

South Korea: Controversial definition with questionable operation record

The South Korean government considers IGCC a “new and renewable energy” technology in *‘The New and Renewable Energy Law’*, which means that the government will support and subsidize it alongside solar and wind power. The term "new energy", however, is defined as “any energy form that is converted from existing fossil fuels before combustion” which includes liquefied or gasified coal and gasified heavy residual oil, etc.

The first pilot IGCC unit started operation in Taean CFPPs complex in 2016 and there are two more planned projects. These projects have been regarded by companies and media as “clean power plants”. However, the type of technology does not satisfy emission requirements. In April 2015, the Board of Audit and Inspection of South Korea issued a “warning” on an IGCC project operated by the South Korean Western Power Co., Ltd. after an inspection. They claimed that their IGCC plant’s efficiency did not meet expected performance thus failing to provide emissions reduction.

Chapter 3 Current Regulations on Coal-fired Power Plants

The current administrations of both China and South Korea are clearly heading towards coal reduction, largely due to the strong command and control measures under the air pollution policies. In particular, China has implemented the world's most stringent environmental standards in the thermal power sector. Other policy measures such as environmental impact assessment and carbon pricing system are also being implemented in all three countries, with different requirements, practices, and coverage.

Leading Policy on Coal Power

China: Air pollution policy prevails rather than climate policy

The *'Air Pollution Prevention and Control Action Plan (2013-2017)'* advances the government's commitment to long-term coal use reduction. From 2010 to 2016, the share of coal in the national primary energy consumption decreased from 70 to 62%[22]. Experts estimate that the share might drop to 58% by 2020[23]. The installed capacity share of coal will decline from 2015 to 2020 while all renewables except hydropower will grow during the same period[24].

The "Coal Cap Program", coordinated by Natural Resources Defense Council's Beijing Office, signifies key elements of energy transition in China's future. The upgraded pollution emission standards for coal power have strong regulatory impacts on the industry. Since renewables have become more competitive in cost compared to conventional energy, the coal power sector is facing an increasingly competitive market. In recent years, the annual operation hours of coal power have significantly declined. The new national carbon market may provide an opportunity for the coal power industry to cope with challenges from environmental pollution and climate change in the short term. However, the long-term strategy for coal power "Phase Out" has rarely been touched, the power industry should start to figure out a well-thought exit plan by working with all stakeholders in order to avoid consequential social and economic costs in the process.

Japan: Emphasizing more on CFPP technology and ignoring true cost of coal

Preceding the revision of the *'Strategic Energy Plan'*, in the Japan Revitalization Strategy determined by Prime Minister Abe's Cabinet in June 2013, coal power policies intend to:

- Reduce energy costs by introducing highly efficient thermal power generation,

[22] Coal consumption: the continuous declining in the past five years. URL: http://www.sohu.com/a/125496877_394098
[23] The percentage is from a quotation from an interview with Dr. Yang Fuqiang, senior advisor and leader of China Coal Cap program.
[24] The Electric Power Development Plan 2016-2020. URL: http://www.sdpc.gov.cn/zcfb/zcfbghwb/201612/P020161222570036010274.pdf

- Increase efficiency and transparency by auctioning the rights to the construction and replacement of thermal power plants,
- Clarify and expedite environmental impact assessments,
- Improve the investment environment for highly efficient thermal power generation targeting private companies,
- Accelerate innovative technology development and pioneer the development of highly efficient thermal power generation, and
- Globally spread these technologies.

Essentially, the Abe administration included the construction promotion of the so-called "highly efficient thermal power generation" technology both at home and abroad in its Growth Strategy. This direction has not been modified post-Paris Agreement ratification.

Issues on cost of coal: "low cost energy" and low carbon tax rate

Nuclear power and coal are the cheapest sources of power. In May 2015, the government predicted the power generation cost for each source in 2030, with lower bounds as:

- Nuclear: 10.3 JPY/kWh
- Coal: 12.9 JPY/kWh, LNG:13.4 JPY/kWh
- Onshore wind: 13.6 to 21.5 JPY/kWh
- Geothermal: 16.8 JPY/kWh, small hydro: 23.3 to 27.1 JPY/kWh
- Oil: 28.9 to 41.7 JPY/kWh
- Solar (commercial scale): 12.7 to 15.6 JPY/kWh.

However, this calculation does not properly include the external cost of burning coal, namely the impacts of climate change and other environmental and social consequences. Additionally, according an analysis by an NGO, Citizens' Nuclear Information Center in Japan, revealed that due to a decline of LNG price in 2016 and 2017, the cost of power generation using nuclear power and coal is greater than that of LNG under the same calculation methods. Nonetheless, the government continued to proceed with the above energy policy revisions, ignoring the NGO analysis.

In Japan, taxes for Climate Change Mitigation (so called the carbon tax) introduced in 2012 is very weak due to very low tax rate. It imposes an additional 289 JPY/t-CO_2 on all fossil fuels, a considerably low cost. For coal, there is only a 670 JPY/t-CO_2 addition on the originally low Petroleum and Coal Tax. The carbon pricing to incentivize to reduce coal is extremely weak.

South Korea: Put price on coal, with no further move on capping coal

The government has increased consumption tax on coal from 30 KRW/kg to 36 KRW/kg as of April 2018, which was second increase since it introduced the consumption tax on coal for power generation as 24 KRW/kg in April 2014. The government also announced to increase further tax on coal from 36 KRW/kg to 46 KRW/kg while decreasing tax on LNG 84.2 KRW to 15.8 KRW. This tax adjustment is to apply external cost of air pollution to energy cost as environment cost of air pollution from coal and LNG was estimated as 85 KRW/kg and 42 KRW/kg according to the joint research by the Ministry of Finance, Environment and Energy and to adjust the ratio of tax on coal and LNG as 2:1.

However, power generation cost of coal is still cheap and due to current power market system it is estimated that only 0.5%p of current power mix between coal and LNG would be change by tax adjustment. According to the South Korea Energy Economic Institute in 2018, tax on coal should be increased at least over 120 KRW/kg to drastically reduce electricity share of coal.

Environmental Regulations on Coal-Fired Power Plant

China: More room for pollution reduction than efficiency enhancement

The large amount of harmful substances emitted from coal combustion has deteriorated ambient air quality and led to large-scale acid degradation, polluting the environment and negatively impacting human health.

The Chinese government recognizes the significance of pollution issues and has implemented a range of regulatory measures to mitigate carbon emissions. The national regulatory framework for environment is composed of a series of environmental laws, regulations, standards, and measures, as progressively formulated in **Figure 7**. In terms of compliance to the pollutants discharge standards, the environmental regulatory system has played an important role in controlling industrial pollution, including those from CFPPs.

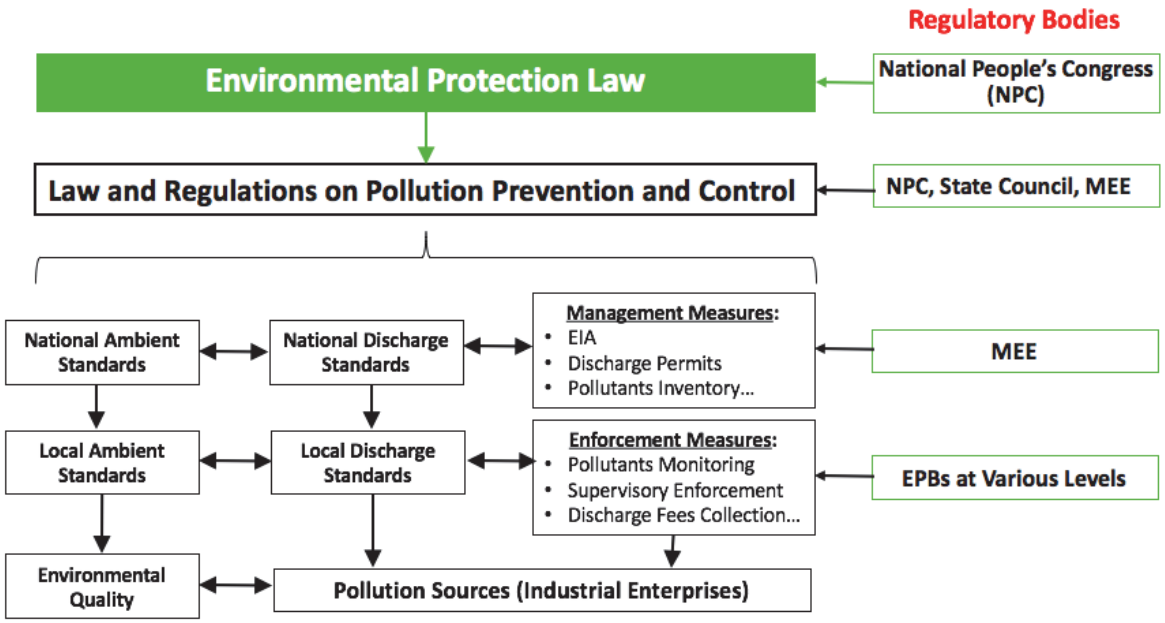

Figure 7: China's national regulatory framework for environmental management

Source: REEI's analysis

The Five-Year Plan on pollutants control for the CFPPs

China currently regulates the total amount of SO_2, NOx and PM in the thermal power industry. In the '*The 11th Five-Year Plan',* China has set energy-saving and emission-reduction targets, including reduction goals for the discharge of major pollutants. China has established detailed rules and operational measures for controlling total pollution in the '*Law on Air Pollution Prevention and Control*'. The Ministry of Environmental Protection (MEP)[25] has also signed letters of responsibility for emission reduction target with every province, which are responsible for monitoring the implementation of emission reduction tasks for the major emitters, including the power sector.

More stringent emission standards for air pollutants from CFPPs

Raising air pollutant emission standards for thermal power plants is another effective way of reducing pollution. As shown in **Table 2**, the first set of standards were created in 1991 and amended in 1996, 2003 and 2011, respectively. Due to severe air pollution episodes around 2010, the 2011 revisions tightened the emission limit values for PM, SO_2, NO_x and mercury such that regulations are stricter than comparable standards in the US, EU, and Canada[26].

Table 2: Historical Emissions Standards of Air Pollutants for CFPPs

Category (*Unit: mg/m³*)	**PM**	**SO_2**	**NOx**	**Mercury**
GB13223-1991	150-3,300 [a]	According to plant physical conditions	None	None
GB13223-1996	150-2,000 [b]	1,200-2,100 [c]	650-1,000 [d]	None
GB13223-2003	50-600 [e]	400-2,100 [e]	450-1,500 [e]	None
GB13223-2011	20-30	50-200	100-200	0.03

Note: the value ranges depend on several factors such as fuel quality, boiler type and capacity, years in operation, dust collector type and location of plant.

Besides tightening the emissions standards, other measures have also been implemented, such as limiting the construction of CFPPs, promoting ultra-low emission CFPPs, pollutants emission trading, and facilitating more renewables to the power grid and so on.

[25] The Ministry of Environmental Protection (MEP) was restructured and renamed as the Ministry of Ecology and Environment (MEE) in April 2018, in this paper we still use MEP if the relevant date is before April 2018.
[26] China's War on Air Pollution. URL: http://www.powermag.com/chinas-war-on-air-pollution/?pagenum=3.

Japan: Energy Conservation Law and the Efficiency Standard

Because of the increasing number of the CFPP construction projects, two major standards applied to both the new and existing ones have been set in a new framework of the '*Energy Conservation Law'.*

In this new framework, a new thermal power plant must meet the generation efficiency of 42.0% for coal, 50.5% for LNG and 39.0% for petroleum and others. This rate has set a high efficiency of the new power generation facilities, because in the Energy Mix, coal-fired thermal power as a whole aim to meet the efficiency level of ultra-supercritical (USC) coal burning technology. Since the existing large-scale projects recently developed are already USC, this would not be an obvious restriction for the new plants: rather, it technically justifies the constructions of more plants.

Additionally, the framework introduces benchmark standards for existing plants comprising of two indicators, A and B, for the electric utility of the existing thermal plants was introduced. Indicator A evaluates whether the generation efficiency of each fuel of the existing thermal plants meets standards (coal 41%, LNG 48% and 39% for petroleum and others). The rationale of Indicator A is to upgrade the country's average power efficiency by immediate abandonment of old thermal plants. Second indicator Indicator B sets the integrated target of the generation efficiency based on the "desirable energy scenario to realize the energy mix" (coal 26%, LNG 27%, petroleum 3%; thermal total 56%) which is set as 44.3%. This indicator aims to improve the efficiency by using the Combined Cycle Power Generation Facility of LNG, IGCC and Co-generation and so on.

However, there are loopholes found in the "special provisions" section in the framework of energy conservation law. For example, when estimating the electricity generation efficiency, the facilities using by-products, biomass fuels and co-generation technology are allowed to deduct their input energy from coal which decreases the efficiency's denominator. Furthermore, the improvement of combustion rate of biomass can lead an even higher efficiency estimation. Moreover, joint achievement is allowed to the operators to meet the target.

In summary, through climate change mitigation activities and energy policies, Japan has promoted many highly-efficient CFPPs by readily approving their constructions. This leads the unprecedented increase of the new construction projects of CFPPs. Although there are EIA and the efficiency standards in the Energy Conservation Law, they do not act as a capping force.

South Korea: Upgrade or Decommission?

Public concerns over health impacts from air pollution have been rising, with the media having linked air pollution to CFPPs. The South Korea Environment Institute, a governmental research body, published a report in November 2015 revealing that the number of coal and gas fired power plants at the end of the 6th BPE would dramatically increase the concentration of $PM_{2.5}$ and causes over 1,100 premature deaths every year.

In April 2016, the President of South Korea acknowledged coal and gas fired power plants as major contributors of $PM_{2.5}$ and promised to find solutions. Consequently, the MOTIE announced the shut down of 10 CFPPs in operation for over 30 years by 2025 as part of its efforts to cut air pollutants in July. The agency also stated that it would reduce the pollutants from remaining power plants by retrofitting and replacing pollution control facilities. Furthermore, it would not approve any new

CFPPs for the next national power plan. Nonetheless, it would still support the new CFPPs previously announced.

President Moon's administration supports a renewable energy transition while phasing out nuclear energy and reducing coal in 2017. President Moon pledged to close the 10 old CFPPs by 2022 instead of 2025 as he reviewed the new coal-fired power plant projects. In March 2017, 8 old CFPPs that are over 30 years old were temporarily shut down to mitigate air pollution for 4 months.

Though the government has fulfilled their promise to deactivate outdated CFPPs, it was unclear about their further moves on the 9 new CFPPs outputting at 8,420 MW in total. The MOTIE found that 9 new coal-fired power projects had switched their fuel from coal to LNG in June 2017. In response, the Ministry had sent inquiries to the four private companies operating 9 new power plants to identify their intention to switch fuel, but none of them replied willingly. In December 2017, the government finalized to push ahead 7 units of CFPPs to be built while switching 2 units of CFPPs (Dangjin) to LNG only.

Impact Assessment

Environmental Impact Assessment (EIA) is a method used to assess the feasibility of construction projects. However, EIA results are only useful when there exists a compatible set of regulatory standards. China's case reveals that an environmental assessment designed to include human health impact would fail due to the lack of compatible health impact assessment standards. Japan's case, on the other hand, points out the importance of transparency of the assessment process which, if not addressed, fails to earn public trust.

China: Issues on standard completeness

Impact Assessments for CFPPs: EIA is not enough

In 2003, China implemented the *'Law on Environmental Impact Assessment'*[27], requiring all major programs and construction projects, including CFPPs, to fulfill EIA requirements. The law outlines overarching procedures for conducting EIAs, and information on detailed implementation should refer to more specific guidelines. Also, the enforcement of the law is relatively poor due to relatively weak environmental departments. Local governments tend to focus on economic development and readily approve construction projects such as CFPPs.

The health impacts from the CFPPs should be assessed in terms of the massive amount of pollutants emitted. The '*General Principles for Environmental Impact Assessment Technology Guidelines'* of the EIA Law explicitly include "public health" as an evaluation factor. However, due to limited data, content, methods of evaluation, and public participation, China does not generally conduct health impact assessments during EIAs. And the situation is that there are no published EIA technical

[27] Law on Environmental Impact Assessment. URL: http://www.zhb.gov.cn/gzfw_13107/zcfg/fl/201609/t20160927_364752.shtml

guidelines on human health, so the current EIA does not clearly define how to assess and predict the potential health effects of a construction project.

But in recent years, well-known domestic experts and scholars has been advocating for the inclusion of human health effects into EIAs. For example, academician Du Xiangfan of the Chinese Academy of Engineering proposed "to further improve the norms, regulations and standards system for environmental management in China", he also emphasized that "health should be part of the assessment and standard-setting".

Japan: Problem of assessment transparency

Under the EIA Law, coal power business operators must conduct an EIA at the early planning stages of large-scale coal power plant construction. However, the EIA process is conducted by the environmental screening advisory committee, a department of the Ministry of Economy, Trade and Industry (METI). This process is prone to conflict of interest. The same person oversees both the EIA and the METI, the latter of which an active advocate of coal use. Moreover, when the Ministry of the Environment, the prefectural governor, or a mayor raise a concern, they must speak to businesses through an intermediary from the METI. As a result, although the METI Minister delivers recommendation to the coal power companies based on the abovementioned concerns on environmental impacts of coal power projects, projects are almost always approved.

For example, in early 2013, despite the Ministry of the Environment declaring the quality of an EIA "Unacceptable", the METI still approved the project. Hence, the existing EIA is not a capping mechanism for environmentally unfriendly coal-fired power plant construction.

Additionally, EIAs face implementation challenges for small-scale projects. Regulations require an EIA for plants generating over 112.5 MW, leading to an increase in new plants operating at under 112.5 MW that do not require an EIA. Even though they are relatively small in generation capacity, plants operating above 100 MW still have a serious environmental impact. More worryingly, some of these plants have begun operating without any third-party assessments.

As a response to the growing number of the small scale CFPPs, the Ministry of the Environment began revising EIA laws in 2014 with the hopes of tightening regulations. However strong opposition from business operators have blocked any meaningful amendments. Instead, the Ministry could only produce the '*Environmental Protection Guideline for the Small Scale Thermal Power Plant'.*

The Ministry of the Environment also published the '*Collective Practice of Desirable Voluntary Environmental Impact Assessment of the Small Scale Thermal Power Plants'* to promote the voluntary EIA of the small scale projects' business operations. Without legal enforcement, many small-scale coal power projects are still built without an EIA.

Carbon Pricing Schemes

To reduce coal consumption, carbon-pricing measures such as GHG emission trading schemes and carbon taxes, is the most economically efficient tool. Many countries in the EU introduced such

schemes in early 2000s. In East Asia, the attitude of the current administrations to the carbon pricing varies between countries.

Chinese national carbon market to cap the power sector first

As previously mentioned, China officially announced the establishment of their national carbon market at the end of 2017. As predicted, the power sector is the only industry included in the market. Current estimates put Chinese power sector emissions at 3.0 - 3.5 billion tons of carbon dioxide per year, making the power sector the source of nearly one third of all energy-related carbon emissions in China[28]. The massive amounts of emissions from the power sector means that China will remain the largest carbon market in the world, 1.5 times greater than the EU ETS.

China's CFPPs have been improving in energy efficiency due to effective policies and technical improvements over the past few years. Currently, Chinese CFPPs are roughly as efficient as international, advanced plants. As a result, there is very limited room for China's carbon emission reductions by improving energy efficiency. Furthermore, it is difficult to identify areas for improving energy efficiency, especially for those power plants, which are newly built or already implement energy saving measures.

In the context of carbon pricing scheme, fuel substitution may be a promising option, such as reducing coal-generated power and increasing power generated by natural gas or even biomass energy. The emission reduction of the power industry after its inclusion in the carbon market will depend on future carbon prices and the development of breakthrough technologies.

Japan has both the carbon tax and ETS

Japan introduced the Tax for Climate Change Mitigation, a Carbon Tax, in October 2012. It imposes additional tax on the current Petroleum and Coal Tax that levies taxes on all fossil fuel. The rate is JPY 289 (circa USD 2.6) per ton of CO_2 emission, the result of a gradual increase over a 3.5-year timespan. However, this tax rate is unquestionably low compared to other countries. According to a World Bank report, the Paris Agreement goals require a carbon tax of USD 50-100 per ton of carbon by 2030. Despite having this insufficient taxation, Japan Business Federation (Keidanren) and others have criticized that "if Japan is the only country to introduce such a high tax rate, such taxes would hinder international competitiveness".

Between 2008-2010, civil society tried very hard to introduce the national ETS; however, groups were unsuccessful due to strong opposition by the industry and Liberal Democratic Party (LDP), the anti-ruling party at that time. Currently the Ministry of Environment (MOE) and civil society are trying again to introduce a carbon pricing scheme nationwide. However, it may be difficult under the current conservative administration. Also, they faced a severe backlash from the economic industry during the discussion on the carbon pricing scheme led by the MOE. On September 2017, the Commission for Carbon Pricing was established and the discussion began again. The MOE shows the

[28] Emissions Trade in China: Power Industry Carbon Emissions Simulation. URL: https://www.iea.org/media/translations/chinese/cbeex.pdf

direction to include the new carbon tax policy in the tax reform by the end of this fiscal year, but the discussion has still not deepened so far.

Whilst the national government is struggling to introduce an ETS, Tokyo and Saitama Prefecture have been working on their own systems[29]. All targeted entities in Tokyo achieved their reduction targets, cutting CO_2 emissions by 14 million tons between 2010 and 2014, during which Saitama Prefecture also reduced their emissions by 22%, exceeding their initial goals threefold. The results in these two municipalities have shown that this scheme is an effective incentive to reduce the emissions.

An established nationwide ETS in South Korea

South Korea launched their national ETS at the begging of 2015, the first nationwide cap-and-trade program in Asia. Covering the power sector, the South Korean ETS includes more than 600 large emitters and accounts for around 68% of the national GHG emissions[30].

The end of 2017 marked the completion of the first phase of the KETS. The second phase will run from 2018-2020 and will see some key changes. The cap of second phase would increase to 1,777 Mt-CO_2 from 1690 Mt-CO_2 of first phase. Auctioning will be introduced with 3% but it would be applied to just 26 out of total 63 business sectors, which means that the other 37 sectors would keep 100% free allocation for international competition according to the Ministry of Environment.

[29] Worth to mention that these two metropolitan level ETS does not include power sector since there is no CFPPs within the territory, they cover the urban emission sources mainly from the consumption of oil, gas and electricity.
[30] ICAP. (2018). Emissions Trading Worldwide: Status Report 2018. Berlin: ICAP. URL: https://icapcarbonaction.com/en/?option=com_attach&task=download&id=547

Chapter 4 Future Trend of Coal-fired Power Plant

When the out-of-date ones are shut down in the following years, many new coal-fired power plants will still be in construction. This is what's happening in all three countries. For example, China's CFPP capacity target for 2020 is 1,100 GW, meaning a large number of plants is yet to be built in the coming years although the overall capacity has become haunting issue already. In Japan, there have been about 50 construction plans for the new plants since 2012. One key reason behind these ongoing plans for new CFPP is the lack of a plan to cap coal consumption for power generation, and the discussion on phasing-out coal has just started.

Future Operations and Construction Plan

China: Still constructing new while shutting down the obsolete

Due to new orders from the NEA and the installed CFPP capacity cap set for 2020, the total number of CFPPs to be operated by 2020 in China should be between 2,500 and 2,700. The Chinese coal power sector also faces a severe over-capacity problem; dwindling demand for electricity due to weaker economic growth and the government slashing of energy intensive industries has caused widespread underutilization of existing coal-fired power generation capacities.

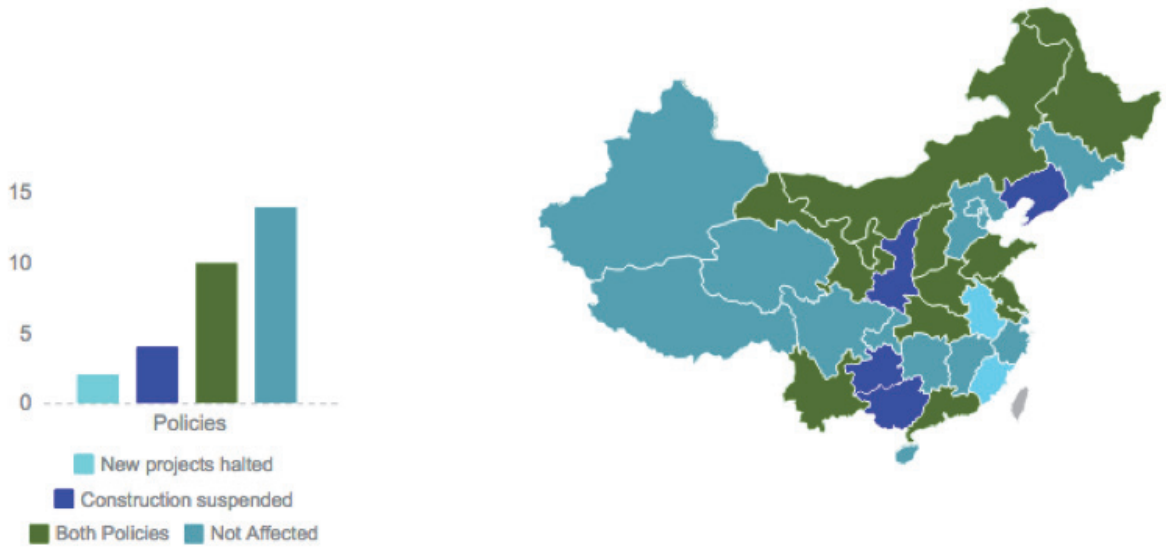

Figure 8: Illustration on NEA' s New Coal-fired Power Plants Policy

Source: China pulls emergency stop on coal power construction. China Dialogue, April 06th 2016 [31]

[31] China pulls emergency stop on coal power construction, China Dialogue. URL: https://www.chinadialogue.net/article/show/single/en/8794-China-pulls-emergency-stop-on-coal-power-construction

In March of 2016, the National Development Reform Commission (NDRC) together with the National Energy Agency (NEA) released the "*Notice on Improving the Orderly Development of Coal-fired Power Plants"* [32] to limit the pace of the Chinese coal power sector's development by halting new projects and suspending construction in certain regions. Said notice requires that the obsolete generation units of 20-25 years old should retire in priority in 2016-2020 if the units are below 300 MW capacity. The total capacity of CFPPs affected by the new policy was estimated to be around 110 GW[33], which means roughly 200 CFPPs considering the average capacity.

The '*13th FYP on Energy Development',* froze the approval of any new coal-fired power projects for two years. The total coal power capacity should remain below 1,100 GW by 2020[34], which means that during 2016-2020 the net average annual growth of coal power capacity is around 40 GW (**Table 3**). In 2016, decommission of obsolete CFPPs was close to 5 GW. It is estimated that the number will amount to 4 GW in 2017, according to the '*Guiding Opinions on the Energy-related Work in 2017*' from NEA[35].

Table 3: Historical and Projected Capacity Growth of the Chinese coal power sector

	Year	**2005**	**2010**	**2015**	**2020**	**2030**	**2050**
Capacity (GW)	Official figures	373	660	895	1,100		
	ERI High RE Penetration Scenario				1,083	1,052	887
	IEA Scenarios				947 (4DS) 882 (2DS)	N.A.	734 (4DS) 530 (2DS)

Source: Author's compilation, based on data from CEC, ERI, and IEA, and report
Note: 2DS: IEA 2°C Scenario; 4DS: IEA 4°C Scenario

To further control the growing number of CFPPs, in September 2016, NEA suspended 15 proposed CFPPs, which accounted for 12.4 GW of capacity due to the overcapacity of coal power fleet and low growth of national electricity consumption. Following in January 2017, NEA issued a new order to suspend another group of CFPPs constructions, accounting for 22.2 GW of capacity. In the meantime,

[32] Notice on Improving the Orderly Development of Coal-fired Power Plants, NDRC and NEA 2016. URL: http://www.nea.gov.cn/2016-04/25/c_135309112.htm (in Chinese)
[33] Coal emergency brake: Energy Bureau stopped substandard coal power project installed quite half of the Three Gorges. The Paper, September24th2016. URL: http://www.thepaper.cn/newsDetail_forward_1533668 (in Chinese)
[34] China raises its low carbon ambitions in new 2020 targets, China Dialogue. URL: https://chinadialogue.org.cn/article/show/single/en/9532-China-raises-its-low-carbon-ambitions-in-new-2-2-targets
[35] Guiding Opinions on the Energy-related Work in 2017. NEA 2017. URL: http://zfxxgk.nea.gov.cn/auto82/201702/t20170217_2602.htm (in Chinese)

20 GW of CFPPs will be shut down between 2016 and 2020[36] and an estimated 420 GW of CFPPs will be retrofitted to ultra-low emissions and 340 GW will have energy efficiency upgrades by 2020[37].

Based on the limit on total capacity of CFPPs and the declining utilization hours, we estimate that after 2020, the coal consumption in the Chinese coal power sector will decline and the long-term downward trend should continue following the Chinese government's announcement of a cap on carbon emissions around 2030. Energy Research Institute (ERI) suggests that under the high renewable energy penetration scenario[38], the projected capacity in 2020 is similar to official targets which by 2030 and 2050, the ERI estimated that their capacity will be at 1,052 GW and 887 GW respectively.

In comparison, the International Energy Agency (IEA) projects that are under the 2°C Scenario (2DS) and 4°C Scenario (4DS), Chinese CFPPs would have a lower capacity than the official target of 1,100 GW by 2020, and the projected capacity in 2050 are 734 GW under the 4DS and 530 GW under the 2DS[39]. The IEA's 2°C scenario analysis seems too ambitious since their assumption is based on the Paris Agreement goal. China as the biggest carbon emitter, on a fair-share basis, needs to make bigger efforts to cut off more carbon emissions through phasing out coal faster.

Japan: Declining numbers, worrying small-scale plants

Since 2012, there has been about 50 construction projects for new CFPPs, 31 of them are large-scale plants and 19 are small-scale as shown in **Figure 9**. Up till now, 7 projects were cancelled, and 8 of them have started operation which left 35 construction project ongoing.

[36] NEA suspends CFPPs in 11 provinces. URL: http://www.guancha.cn/Project/2017_01_17_389838.shtml (in Chinese)
[37] Energy development in the 13th Five-Year Plan issued to adhere to six 'pay more attention to" policy orientation. URL: http://finance.china.com.cn/news/20170105/4056538.shtml (in Chinese)
[38] China 2050 High Renewable Energy Penetration Scenario and Roadmap Study, Energy Research Institute (NDRC), 2015. URL: http://www.efchina.org/Attachments/Report/report-20150420/China-2050-High-Renewable-Energy-Penetration-Scenario-and-Roadmap-Study-Executive-Summary.pdf
[39] Emissions Reduction through Upgrade of Coal-Fired Power Plants Learning from Chinese Experience, IEA 2014. URL: https://www.iea.org/publications/freepublications/publication/PartnerCountrySeriesEmissionsReductionthroughUpgradeofCoalFiredPowerPlants.pdf

Region	Prefecture	Large Scale	Small Scale
Hokkaido	Hokkaido	0	1
Tohoku	Iwate, Akita, Miyagi, Fukushima	7	7
Tokyo	Ibaragi, Chiba, Kanagawa, Shizuoka	9	2
Chubu	Aichi, Mie	1	3
Kansai	Hyogo	6	0
Chugoku	Okayama, Shimane, Hiroshima, Yamaguchi	6	3
Shikoku	Ehime	1	0
Kyusyu	Fukuoka, Nagasaki, Miyazaki	1	3
Sum		31	19

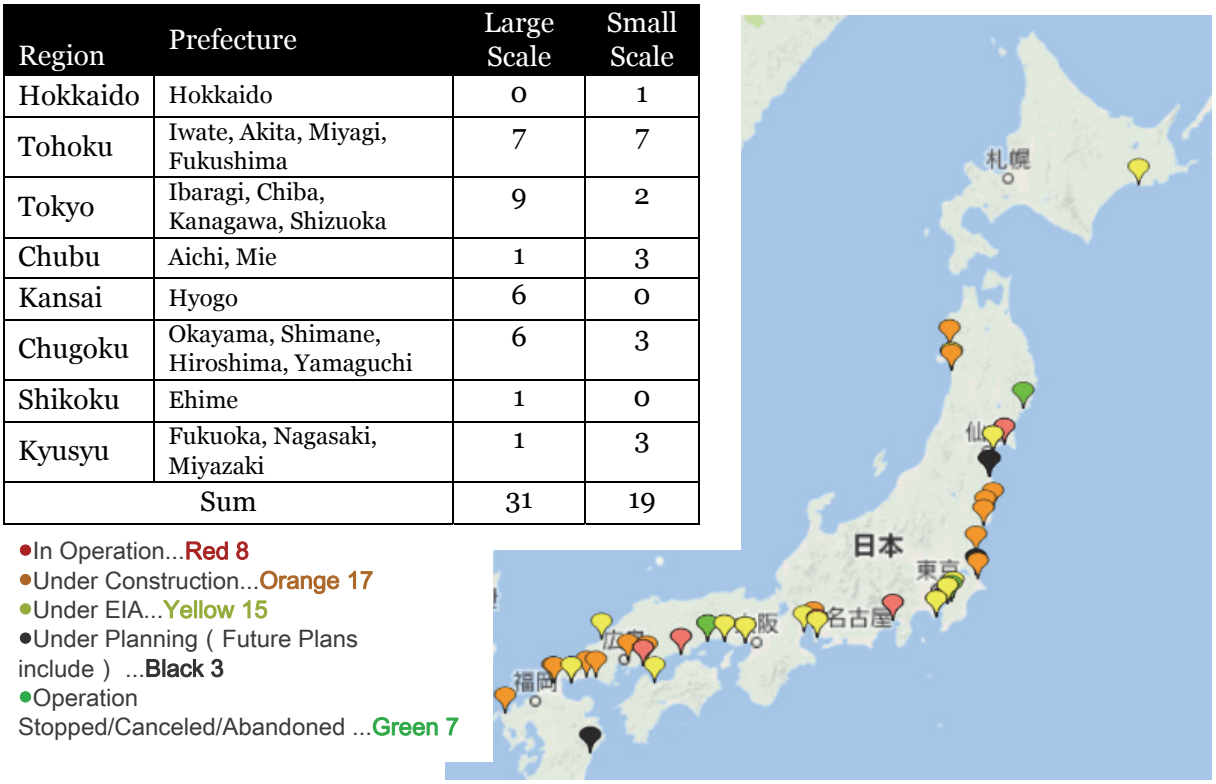

Figure 9: Coal-fired Power Plant Projects in Japan since 2012

Source: Japan Coal Plant Tracker

Large Scale Projects

"Large scale thermal power plants" includes those of which to be regulated by EIA law. Current projects' capacity ranges from 112.5 MW to 1.07GW per plant. Since it usually takes at least 6-7 years from the EIA process to the start of operation, many of them have to be activated after 2020.

The majority of them are ultra-supercritical (USC). However, according to the disclosed number from EIA, some plants has been detected to emit a higher concentration of pollutants compared to those started operations in 2009. Additionally, there are pilot IGCC plants. Amongst the 31 new large scale projects, 5 of them were cancelled, 2 were put into operation, 12 are already under construction and 10 are under EIA process. Those that are currently under EIA will soon be entering the final assessment phase before final approval.

During this period, some previously suspended projects have been resumed. Those projects began in late 1980s aiming to combine generators units from different electric power companies into each single power plant. But in reality, only one such power plant began operating while others were suspended.

Considering the rapid construction of new plants, it is fair to say that Japan is in the midst of coal projects boom, with new plants popping up and thermal power auction system being developed.

The auction system, in particular, allows the old plants belonging to Tohoku/Chugoku/Kyushyu Electric Power Co. to be "self-bidding" which help them to be resurrected from zombie state.

Small Scale Projects

"Small scale thermal power plants" are the ones operating under 112.5 MW and are not regulated by national EIA law. Some projects have to comply to locally regulated EIA, with a one-year assessment time. There are indeed some municipalities who have their own EIA regulations for coal power projects. However, in the areas lacking local regulations, construction can begin without any environmental impact assessments. 6 of those projects across the country are already in operation, including the Suzukawa Energy Center in Shizuoka, Sendai Power Station in Miyagi and Nagoya II Power Plant in Aichi.

The problem of the small scale coal power projects is that most of them use subcritical (SC) technology in their combustion process. They operate at a lower efficiency than the required levels by the new *'Energy Conservation Law'*. Under such circumstances, some plants rushed into operation before the regulations took effect in April 2016, while others had attempted to bring in by-product gas or biomass fuel in order to pass the new legal standard through previously discussed legal loopholes.

South Korea: Total capacity still increasing, with several governmental cancellations

After 3 units of outdated CFPPs were shut down in 2017, 7 other units were planned to be closed by 2022. Additionally, two other CFPPs units in Yeongdong which began operating in 1973 and 1979 would be converted into biomass power plants. Out of the 61 existing units of CFPPs in operation, 13 units are subcritical, which are least efficient, 34 units super-efficient and 13 units ultra-super efficient.

A new coal plant project named Dangjin Ecopower was finalized to be cancelled or converted into a LNG-fired power plant project at an announcement of the 8th BPE in December 2017. As of December 2017, 7 units in 4 CFPPs are under construction, totaling 7,260 MW, they are scheduled to be constructed by 2022 allowing the coal capacity to increase from existing 36.9 GW to over 42 GW in 2022.

The 4 power plants are:

1. Shin Seocheon project, a 1,000 MW coal power plant constructed by South Korea Midland Power (KOMIPO) to replace the two 400 MW coal plant units of coal plant in Chungnam Province;
2. Goseong Hai project, which contains two 1,040 MW units of coal plant constructed by SK Gas, KOEN and KB Kookmin Bank in South Gyeongsang Province;
3. Gangneung Anin project, containing two 1,040 MW units of coal plant constructed by Samsung, KOEN and KB Kookmin Bank in Gangwon Province; and
4. Samckeock Pospower project, containing two 1,050 MW units of coal plant constructed by POSCO Energy in Gangwon Province.

Specifically, the Samcheock Pospower project just obtained the EIA approval on 28 December 2017, only a few days before its licensing period deadline due to controversy around air pollution and coastal degradation issues, which needed time to obtain public consent. After the Energy Ministry's approval, the South Korea Development Bank (KDB) approved to finance the project in 2018.

Another project called the Gangneung Anin project was financed by leading financier of the KB Kookmin Bank with KRW 4.5 trillion.

After the Presidential election in May 2017, the Moon government announced that it would reconsider two coal power plant construction projects awaiting final approval. Meanwhile, it cancelled the "Dangjin Eco Power" project in Chungnam Province during the announcement of the 8th BPE in December 2017. However, coal power capacity in the country would still increase from existing 36.8GW to over 42GW in 2022, before decreasing to 39.9GW in 2030. The percentage of coal as a fuel in electricity production would still remain the largest at 36% in 2030, a narrow drop from 40% in 2016[40].

Future Policy Direction on Coal Power in China

According to the '*Electric Power Development 13th Five-Year Plan',* there is a new projected coal power capacity of 10 GW by 2020, meaning coal will play a smaller role in the next decade. One major reason for this is the concern for the environmental impacts from the Chinese Sector. The incremental increases electricity demand will be met by wind power, solar PV, and other renewable energy sources. Coal originated electricity will take the main responsibility to maintain grid stable. With the current power market reform and the decreasing cost of renewable energy power generation, coal power's competitive advantage in cost is shrinking, if not getting destroyed.

Further tightening of existing standards

According to the Ministry of Environmental Protection statistics, at the end of 2015, China had nearly 100 GW of coal-fired power units that completed ultra-low emission technological transformation. According to the '*13th Five-Year Plan on Energy Development',* the completion of ultra-low-emission coal-fired power plant transformation should reach 420 GW by the end of 2020. The MEP released the '*Full Implementation Plan of Ultra-Low-Emission Coal-Fired Power Plants and Energy-Saving Retrofitting Program'* at the end of 2015, aiming to accelerate the progress of CFPPs to achieve a nationwide ultra-low emission standard and necessary upgrades for energy conservation purpose[41].

According to the Plan, future emission standards for the coal power system in China would meet ultra-low-emission requirements with PM, SO_2 and NOx below 10, 35 and 50 mg/m^3 respectively.

[40] MOTIE, Ministry announces 8th Basic Plan for Electricity Supply and Demand, 12 December 2017. URL: http://english.motie.go.kr/en/tp/energy/bbs/bbsView.do?bbs_seq_n=605&bbs_cd_n=2

[41] Notice on 'Full Implementation Plan of Ultra-Low-Emission Coal-Fired Power Plants and Energy-Saving Retrofitting Program" December 11th 2015, MEP. URL: http://www.mep.gov.cn/gkml/hbb/bwj/201512/t20151215_319170.htm (in Chinese)

China's goal is to let all of the country's new and existing CFPPs with the proper conditions to transition to ultra-low emissions by 2020. The country's eastern region (11 provinces/municipalities) also aims at complete the ultra-low emission upgrades by 2017, the central region (8 provinces/municipalities) would strive to complete by 2018, and the western region, the least developed 12 provinces/municipalities, will try to meet the target by 2020.

Cost-effectiveness should be considered since retrofitting to Ultra-Low Emission will cost as much as 0.24% of the Chinese GDP (2014), according to a team of researchers at Peking University[42]. Their study showed that the pollutant-mitigation costs are around 44,600 CNY per ton of SO_2, 23,500 CNY per ton of NOx, 4,300 CNY per ton of PM. It would be costly to implement the ultra-low emission transformation in the whole power industry. They also suggested that the government should initiate the implementation of Ultra-Low emission transformation from the smaller power plants with lower coal quality.

Introduction of cap and trade programs on pollutants

To implement the National Council's order on the reinforcement of the pollutant discharge permit system, the Ministry of Environmental Protection released the "Circular on Printing and Distributing the Interim Provisions on the Administration of Pollutant Discharge Permits" at the end of 2016[43], aiming to detail the operation of the new discharge permit system. In early January 2017, the MEP released an order designating the power and paper industries as the leading sectors to exercise the permit system[44]. These latest moves in the pollutant discharge permit system have shown government's resolution to control the total amount of the pollutants from key industries, establishing a sound MRV system, and using market mechanisms to solve the air pollution issues.

Scheduled retirement of existing plants

As mentioned earlier, under the "13th Energy Development Five-Year Plan", the government will not approve new CFPPs for the first two years and the total coal power capacity is expected to remain below 1,100 GW by 2020. In addition, it is estimated that by 2020, the Chinese coal power sector will see a capacity of 420-580 GW of CFPPs retrofitted to ultra-low emission and efficiency upgrading of 340 GW of CFPPs, with an annual closure of 4 GW of obsolete capacities during 2016 to 2020, totaling 20 GW [45,46.]

According to relevant provisions in the "*Notice on Improving the Orderly Development of Coal-fired Power Plants"* by the NDRC and the NEA, the Chinese government is going to phase out obsolete CFPPs, which failed to meet the requirements of energy efficiency, environmental impact, and safety.

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[42] ZHAO Dong-yang, JIN Ya-na, ZHANG Shi-qiu Cost-effectiveness analysis of pollution emission reduction measures and ultra-low emission policies for coal-fired power plants. *China Environmental Science*. 2016,36(9):2841~2848. (in Chinese)
[43] Circular on Printing and Distributing the Interim Provisions on the Administration of Pollutant Discharge Permits, MEP December 23rd 2016. URL: http://www.zhb.gov.cn/gkml/hbb/bwj/201701/t20170105_394012.htm (in Chinese)
[44] Notice on Carrying out the Management of Emission Permit for Elevated Sources of Thermal Power, Paper Industry and Beijing-Tianjin-Hebei Pilot City, MEP January 5th 2017.
URL:http://www.zhb.gov.cn/gkml/hbb/qt/201701/t20170106_394017.htm (in Chinese)
[45] Energy development in the 13th Five-Year Plan issued to adhere to six 'pay more attention to" policy orientation. URL: http://finance.china.com.cn/news/20170105/4056538.shtml (in Chinese)
[46] Notice of the State Council on the Work Program of Energy Saving and Emission Reduction in the 13thFive-Year Plan. URL: http://www.gov.cn/zhengce/content/2017-01/05/content_5156789.htm (in Chinese)

The priority will be given to CFPPs below 300 MW that have been operating for over 20 years of pure condensate unit and pumping condensate units.

Chapter 5 Civil Movements on Coal Power

China's energy policies in the last decade have restricted coal consumption in favor of renewable and low-carbon energy sources. As outlined above, due to China's strong government and political climate, energy transition in China has largely been driven by policy reform. However, there has been a trend in civil society, demanding an energy transition based on environmental sustainability. The trend is mainly about the collective actions raised by organizations, such as civil organizations, citizens living near coal power plants, researchers, and lawyers. Relatively speaking, movements in Japan and South Korea are more vibrant and dynamic.

Nationwide Activities

China: Evidence Based Influence

Nongovernmental Organizations (NGOs)

Environmental nongovernmental organizations are one of the largest NGO groups in China, playing a significant role in addressing the environmental concerns across the nation. NGOs have played key roles in lobbying for policy change, environmental protection initiatives, and helping pollution victims gain access to legal help[47]. NGOs in China have also worked specifically on energy issues and coal powered plants.

For example, in 2013, some fifty Chinese environmental NGOs led by the Greenovation Hub sent an open appeal letter to the China Banking Regulatory Commission (CBRC), calling upon the commission to reject the establishment of the China Coal Bank by 15 coal firms. Although the bank was not established due to suspicions of fraud, the campaign is an engaging example of Chinese NGOs' coordinated work against coal.

Since 2015, China has revised and implemented the new "*Environmental Protection Law",* which allows civil organizations to file legal claims under the new legislation, allowing citizens to more easily file environmental complaints and take other legal action. Furthermore, in the past two years, cases against environmental pollution were brought up in bulk by NGOs. While this is promising for future action against coal mining and coal power plants, there are limits to the capabilities of NGOs due to their dependence on the Chinese government, as well as the limitations and regulations the government places on such organizations. Further, initiatives and litigation are significant financial burdens on NGOs.

Public Opinion & Anti-Air Pollution Movement

Coal has been the primary source of carbon emissions and air pollution in China. Since severe air pollution has been a driving factor in energy policy change, citizen and NGO actions in regards to

[47] Ewoh, Andrew I.E. and Rollins, Melissa (2011) " e Role of Environmental NGOs in Chinese Public Policy," Journal of Global Initiatives: Policy, Pedagogy, Perspective: Vol. 6: No. 1, Article 3.
Available at: h p://digitalcommons.kennesaw.edu/jgi/vol6/iss1/3

CFPPs have largely centered on air pollution and subsequent health concerns, catalyzed by severe air quality when coal usage peaked in 2013. Policy discussion began matching rigorous public dialogue regarding coal and air pollution ever since. 2013 was the year that brought record-breaking high levels of $PM_{2.5}$ concentrations and smog, resulting in a "Declaration of a War Against Pollution" by the MEP[48]. Demands for transparency in regards to coal and air pollution from the public and China's environmental NGOs rose through multiple platforms, including social media, documentaries, and independent research. The widespread awareness about coal pollution and air pollution is an example of the combined work of numerous civil society campaigns.

Research, Data Collection, and Transparency

There has also been demand for more environmental assessments and data collection of China's environment, primarily focusing on the environmental impacts and regulatory compliance of coal power plants. Not only NGOs, national and international governmental and corporate stakeholders are also interested in this information.

For example, The Institute of Public and Environmental Affairs (IPE), a non-profit environmental research organization in Beijing, applies transparent data collection methodology. IPE is dedicated to building a database of environmental information based on environmental supervision records and emissions data from thousands of power generating facilities[49].

Japan: Coal Plant Tracker and relevant activities

In 2013, in response to the Coal Plan Boom, Kiko Network has established the website "Don't Go Back to the Sekitan (coal in Japanese)! (sekitan.jp/en)" in order to provide a platform for coal-fired power plant issues in Japan.

In 2014, Kiko Network listed the proposed new projects and uploaded the "Japan Coal Plant Tracker" with the location information of each new sites. Using the map, during the period of EIA public announcement of these new projects, they have collected and published citizens" opinions related to each of these sites. In 2017, list of existing coal power plants was also added in the Japan Coal Plant Tracker which gives the opportunity of the citizens to form local movement and ensure compliance of the power plants to national policy.

South Korea: Collaborative NGOs and a supporting mayor

The South Korea Federation for Environmental Movements (KFEM) and Greenpeace are groups which have campaigned nationally against coal in South Korea. Those civil society groups' priority is to prevent new CFPPs from expanding under the government's policy. KFEM has worked on coal with local groups for years and Greenpeace has just started to campaign on coal by publishing a study on premature death from coal burning in 2015.

[48] Jin, Y., Andersson, H., & Zhang, S. (2016). Air Pollution Control Policies in China: A Retrospective and Prospects. *International Journal of Environmental Research and Public Health*, *13*(12), 1219. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5201360

[49] IPE's database on regulatory info. URL: http://wwwen.ipe.org.cn/Indus tryRecord/Regulatory.aspx

In 2016, movements aimed at helping South Korea phase out coal had grown powerfully. As public concern over air pollution increased, the government's policy to build more CFPPs upset the public. Local residences arranged a rally and hunger strike in July 2016 to demand the government's cancellation of the new coal plant in Dangjin, Chungnam Province. Mayor of Dangjin has joined the strike with 19 civil society organizations, and the organizations have published a joint statement which helped successfully delay project approval.

In March 2017, the environmental NGOs organized the "Break Free" action in Dangjin with thousands of participants, the biggest march in the "Beyond Coal Movement" history in South Korea. In May 2017, eight civil society groups opposing the new coal projects formed the "People Action against Coal". Civil society's suggestion on coal was subsequently adopted by President Moon who later promised to review the 5 coal projects. But eventually, the government had finalized to cancel only one project.

Community Activities

China: Protests in the South

Protests Against Coal Powered Plants

At a local level, there have been demonstrations made by the Chinese citizens about their discontent against the construction of coal-powered plants. The majority of cases observed is in southern China.

For examples in 2012, there have been protests in Hainan province and multiple key economic area in Guangdong province. In early 2012, thousands of people in the town Yinggehai, on Hainan Island, protested against the construction of a CFPP. The protesters expressed their concerns that coal plant pollution will harm their fishing and farming businesses. Due to the strong objection from local residents, the plant site was first moved further north and later to a nearby county. The construction of the plant has not yet begun and protests from the residents are readily expected whenever the new site location is disclosed[50].

In 2012 in Ordos, Inner Mongolia, Greenpeace exposed environmental violations from Shenhua coal plant in their report "Thirsty Coal". In 2014, after two years of ongoing negotiations and pressure from the NGO and their partners, the local government suspended Shenhua from pumping groundwater. The local government informed that financial compensation would be paid to those affected by the company's industrial activities[51].

[50] Hainan residents against construction of coal-fired power plant, China. URL: https://ejatlas.org/conflict/hainan-residents-against-construction-of-coal-fired-power-plant)

51 How NGOs forced China's biggest coal company to back down over groundwater extraction. URL: https://www.chinadialogue.net/article/show/single/en/6977-How-NGOs-forced-China-s-biggest-coal-company-to-back-down-over-groundwater-extraction

Additionally, in 2015, a reported crowd in thousands in the China's northeastern Guangdong province staged a protest against the construction of a new CFPP by Shenzhen Energy [52], which would have been the second coal-fired plant near the city. The residents started a petition, collecting 30,000 signatures against the project. In this case, many of the protesters stated air pollution as their main concern. But in this case, there was no immediate response from the government.

More recently, in 2018, Shenzhen's Heyuan coal power project is on hold due to the 2016 and 2017 national policy on limiting coal project expansion. In 2017, China's National Energy Administration announced the cancelation of approximately 100 coal power projects. The Heyuan coal power project was slated for 2018-2022. Although the Heyuan power plant and other constructions slowed down, the relationship between protests and capping of coal power projects is hard to build up. The protests reflected the public discontent, but the pace of coal power development slowed down largely thanks to the government's ongoing initiatives on addressing air pollution and overcapacity.

Legal Recourse by Chinese Citizens

As mentioned above, China's Environmental Pollution Act has cleared a larger path for legal actions to take place against environmental polluters. Multiple entities have sued the government over general pollution issues, but lawsuits have been mainly targeted at CFPPs and their failure to comply with legal standards[53]. Many of these cases remain unresolved, untried, and censored within the media. However, there exist legal aid centers, such as the Center for Legal Assistance to Pollution Victims (CLAPV), which help citizens get volunteer attorneys and take legal action for environmental protection.

Japan: Expanding Local Action Groups

Although a number of CFPP projects are in progress in Japan unnoticed by local residents, there are several movements led by locals that raise awareness and appeal to the local administration and council, and to form protest against the power business operators. There are also networks established by NGOs in different cities in the Tokyo Bay Area used as platforms to encourage immediate protesting actions.

Sendai Bay

In Sendai bay, which is one of the affected areas of the Great East Japan Earthquake, there are two coal power projects. One is already in operation, and the other has announced to switch the fuel from coal to purely biomass. This few amount of coal power plant as well as the transition to clean fuel are regarded as an achievement of continuous local powerful movements by the group of Anti-Coal Sendai Bay. Additionally, because of this movement, Sendai city decided in October 2016 to conduct an EIA on all of the thermal power plant under the municipal regulation and to announce a policy to limit new constructions in December, 2017).

52 10,000 protest in Chinese city over planned coal-fired power plant. URL: http://www.scmp.com/news/china/article/1765010/10000-protest-chinese-city-over-planned-coal-fired-power-plant

53 Lawyers sue Chinese authorities for not getting rid of smog. URL: https://apnews.com/74c322aef89443deaa926305d912c643

This group had been pushing the power plant operators to abort projects. Despite all that, the plants started its operation in July 2017 as scheduled. On September 2017, local residents brought this case to the court for injunction, and the trial is still ongoing.

Hyogo (Akoh, Takasago, Kobe)

In Hyogo Prefecture, Kansai region, 6 reactors were planned to be constructed in three different cities, namely, Akoh, Takasago and Kobe. After Kiko Network began holding seminars targeting the local residents about the issue, two projects in the Akoh and Takasago areas were abandoned in April 2016 and in April 2017 respectively.

On July 2017, the group dealing with the issues of the coal-fired power plant at Kobe (Anti-Coal Kobe) was established by the Kobe citizens. The CFPP planned in Kobe are located quite close to the residential area where a history of pollution and victims can be found. In December 2017, about 500 citizens applied for the procedure of the Pollution Compensation against the Kobe Steel Ltd. and Kansai Electric Power Co. But the company has submitted construction plans in the summer of 2018 and started construction. Residents living mainly in Kobe City took a legal action against Kobe Steel Ltd., and Kansai Electric Power Co., Inc. (KEPCO). in the Kobe District Court. Like Sendai, they brought this case to the court for injunction to prevent the construction and operation of the power plant. In addition, on Nov. 19, 2018, they sued the Japanese government for the negligence of formulating proper climate policy.

Tokyo Bay (Chiba, Yokosuka)

Protest was also on the rise in Tokyo Bay area since spring in 2017. There had been 4 active groups in each of the 4 main cities, namely, Sodegaura, Ichihara, Chiba, and Yokosuka, in the Tokyo Bay area. These 4 groups have made a network called “The Group for Studying the Issues of the CFPPs in Tokyo Bay Area (Anti-Coal Tokyo Bay)” in May 2017. They have been submitting requests to the administrations and the power plant operators since then.

In March 2017, the project in Ichihara was cancelled, but the plans in other three cities still remain and are under the EIA process. Since 3 remaining projects are located around the bay area, the impact of hot waste water discharged into the inland sea, and the compounded issue due to the pollution are concerned. In Chiba city, neighborhood residents have reported foul smell, steel slag, and coal dust from the JFE Steel East Japan Iron Works. Unlike other cities, the basic tactic of the protest in Chiba city is to improve their city’s current situation before dealing with issue from new plants’ construction.

In Yokosuka, the decommissioning and removal of the thermal took place without any explanation to the residents, who have raised concern over asbestos. Anti-coal Yokosuka had held a survey campaign in front of a station and raised public awareness of the issue in the area.

Since these 4 new projects are located around the bay area, groups are also worried about the impact of hot waste water discharged into the inland sea in addition to pollution. The groups had already taken this into account as their evidence to promote their actions.

South Korea: Limited Actions Seen

Samcheock is a region with a long anti-nuclear movement. Protests against a proposed nuclear plant led to a local referendum. However, the local government does not have a strong political will to oppose coal plants because the managing power company, POSCO, persuaded the government that the plant will utilize a cleaner technology and more importantly, will boost the local economy. Though ineffective, the local groups had delivered their opposition to the project to the local and central government by holding rallies and sending letters.

Gangneung has a civil society group for "anti-coal action" to oppose the Gangneung Anin coal project. After the project began with the government's approval, the civil society group had collaborated with residents, environmental groups and local member of city council to oppose the project.

Mixed Success Stories

China: Convergence of Policy and Public Opinion

Increased public opinion against coal and pollution in conjunction with stricter environmental policy has demonstrated the Chinese government's consensus against coal. However, civil society is extremely complex in China due to the country's political environment. There has been an increase of nonprofit and social organizations, which have become increasingly important in forming environmental policy. Yet, in some cases the government remains restrictive. At times, NGOs and civil interference leads to tangible legal results; however, in other cases the civil society's opposition to coal power projects and China's policy against coal is arguably correlation rather than direct causation.

Thus, despite the above examples of civil action, there have also been critiques regarding the civil movements to stop coal projects in wealthier areas. This is compounded with China's social issues, including the fact that the burden of pollution is often shifted to the poorer population of China's society, such as rural individuals and migrant workers, that have to live with certain coal industrial pollutions, trading health in exchange for greater financial stability.

Japan: A Story of Partial Success

By October 2018, eight units located in five regions were cancelled which is likely a resulting from local movements.

The Kansai Electric Power Co. previously announced the continued operation of a current plant in Akoh, Kobe, due to the reconsideration of the fuel conversion plan of replacement of heavy oil, crude oil and coal. The reason behind cancellation, according to the company, is the decrease in electricity demand under energy saving plan and the need to reduce CO_2 emission.

Also in March 2017, the plan in Ichihara, Chiba, another plan carried out by the Kansai Electric Power Co. with TonenGeneral Sekiyu K.K as a joint owner, was cancelled. This was a case that had being

rated as “Unacceptable” by the Environmental Minister in2015. The reason, although is not officially announced, is reported that the TonenGeneral had rated the operation of coal-fired power plant as overly risky.

In June 2017, it was announced that the plan of Ofunato Biomass combustion plant (tentative) operated by Maeda Corporation in Ofunato, Iwate, was replaced from the biomass fuel to purely woody biomass fuel. This happened because of the Paris Agreement.

Thus, although the citizens won the victory in several projects, the 8 CFPPs has started operation and the other 35 CFPPs planned are still remain. Further spreading of the movement and stronger network formulating are required.

South Korea: Citizen-led movement

Dangjin, Chungnam Province

After 8 years of struggle, Dangjin citizens finally led to the cancellation of a new coal plant project, Dangjin Ecopower in December 2017. The new coal project would have been the 9th and 10th units of CFPPs in the region. The citizens had formed a joint nonpartisan group with over 120 local organizations. However, at the public hearing in 2010, the company violently blocked the entrance of the protesting citizens.

Citizen groups had initially focused on the issue of power transmission line. However, since 2015, the group expanded its focus to CFPPs. In July 2016, a thousand citizens of Dangjin had gathered a rally in front of the Energy Ministry building in Sejong. After the demonstration, citizen leaders held a hunger strike in Seoul with participation of Mayor of Dangjin which successfully attracted political attention.

Later, the citizen group had gathered over 11,000 signatures from local referendum against the coal project in 2017. However, the Ministry of the Interior and Safety responded that local government did not have authority to hold a local referendum on construction of coal plant. In April 2017, a month before the Presidential Election, the government tried to push ahead the approval of the project, but then faced resistance from civil societies. KFEM had also requested the Board of Audit and Inspection (BAI) to investigate the government’s push for approval[54].

During the movement, the mayor of Dangjin city and governor of Chungnam Province officially issued a formal statement opposing the new coal plant project. A Member of the National Assembly for Dangjin had also worked actively to deliver demand of citizens to the government and the National Assembly. As a result, at the announcement of the 8th BPE in December 2017, the Dangjin Ecopower project was confirmed to be gas-fired and would be built elsewhere.

[54] More Bad News for Environment: Another Coal-Fired Power Plant Coming to South Korea, KOREA EXPOSE. URL: https://www.koreaexpose.com/korean-government-approval-dangjin-coal-plant/

Pohang, Gyeongbuk Province

A coal-fired power plant proposed by industrial conglomerate POSCO was cancelled due to the citizens' advocacy for clean air. POSCO had proposed the construction of a 500 MW coal-fired plant at its vast Pohang Steel Industrial Complex in Pohang 2015. However, local residents and environmental groups opposed the proposed project as it would contribute to a worsening of air pollution. Existing POSCO facilities, such as its steelworks and the adjoining Pohang Port through which coal and iron ore are imported, are already major polluters in the region.

7 local civil society groups formed a network and organized citizens to oppose the POSCO's project and to protect the city's clean air. Finally, in September 2016, the government published a formal position with the Environment Minister stating "as the importance of greenhouse gas emissions reduction magnifies, the government has discussed about construction of coal power plant in Pohang and does not support the project".

Conclusion

In the Chinese, Japanese, and South Korean energy systems, coal is still the predominant energy source. Nonetheless, it is encouraging to see that the energy transition, namely less dependence on conventional energy such as coal and more utilization of renewable energy, is underway thanks to more stringent environmental regulations, public concerns on the environmental harm of using fossil fuels, and increasingly affordable renewables.

Before getting overly optimistic about the energy transition, we need to review our current dependence on the coal. When shutting down the out-of-date CFPPs, many new plants are under construction. For example, in China, 45.8 GW of coal power was installed in 2017 and 50.5 W in 2016 according to the annual statistics by China Electricity Council; in Japan, there have been about 50 construction plans for the new plants since 2012; and several new ones for South Korea. One key reason behind these ongoing plans for new coal power plants: these countries have neither a plan to cap coal consumption for power generation nor a coal exit strategy. Some western and northern European countries are already implementing or debating either one or both of these policies.

However, the current administrations of both China and South Korea are clearly heading for the coal reduction. In China, from 2010 to 2016, the percentage of coal in the national primary energy consumption decreased from 70% to 62%. This mainly results from stringent command and control measures under the air pollution policies. In South Korea, the Moon administration announced to review the planned coal power projects. On the other hand, in Japan, the energy policy of the current conservative administration is very similar to the energy policy before Fukushima Daiichi nuclear accident in 2011. The Japanese government considers both the and nuclear as an important base-load electricity source.

Civil society has been working hard for facilitating the energy transition, especially in Japan and South Korea. For instance, Japanese climate NGOs established websites and other networks to discuss issues related to coal-fired power plants. In Sendai city and Kobe city where coal-fired power plants are either finished or undergoing planning, local residents brought cases to the court for injunction. In South Korea, local people near construction site of the coal-fired power plant in Dangjin, Chungnam Province staged a rally and hunger strike in July 2016 to demand the government to cancel the new coal-fired power plant.

Across the three countries, the export of the coal-fired power plants to less-developed countries are of great concern to the international community. Although the “domestic” energy transition is underway, overseas entities criticize big power companies’ export of the coal-fired power technology, which are usually financially backed by their respective governments.

With regards to the way forward for a cleaner energy system, namely using less coal and speeding up the energy transition, each country must consider their own solutions to make the transition affordable and just. As for Japan, although business owners and investors are becoming aware of the risk of investing in coal-related projects, the pace of the energy transition is significantly slow under the current administration; therefore, along with stronger voices by the domestic civil society, more international collaboration would be necessary. As for China, air pollution and structural change of the modernization of the industry will continue to play big role to reduce the consumption of the coal. The concern around this rapid transition is the “just transition”, which means how the people, for example in the coal industry, can move to other industries smoothly. As for South Korea, air pollution and nuclear safety will remain a concern to the general public, which supports the current policy of the Moon administration.

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