

REPORT

Business Sector Action to Drive Carbon Market Cooperation in Northeast Asia

An Asia Society Policy Institute Report
produced in collaboration with KPMG Samjong



Business Sector Action for Carbon Market Cooperation in Northeast Asia

MAY 2018

**AN ASIA SOCIETY POLICY INSTITUTE REPORT PRODUCED
IN COLLABORATION WITH KPMG SAMJONG**



With a solution-oriented mandate, the Asia Society Policy Institute tackles major policy challenges confronting the Asia-Pacific in security, prosperity, sustainability, and the development of common norms and values for the region. The Asia Society Policy Institute is a think- and do-tank designed to bring forth policy ideas that incorporate the best thinking from top experts in Asia and to work with policymakers to integrate these ideas and put them into practice.



KPMG Samjong is the Korean member firm of KPMG, a global network of professional services firms providing audit, tax, and advisory services. KPMG's Climate Change and Sustainability practice helps organizations better understand policy, regulatory, and business environments related to climate change and sustainability issues. KPMG provides advice on climate finance and minimization of regulatory risks from carbon emissions and creates new business opportunities in the global carbon market.

The Asia Society Policy Institute and the Asia Society take no institutional positions on matters of public policy and other issues addressed in the reports and publications they sponsor. All statements of fact and expressions of opinion contained in this report are the sole responsibility of its authors and may not reflect the views of the organization and its board, staff, and supporters.

© 2018 The Asia Society. All rights reserved.

The Asia Society Policy Institute

Web: AsiaSociety.org/Policy-Institute

Facebook and Twitter: @AsiaPolicy

Email: policyinstitute@asiasociety.org

New York

725 Park Avenue
New York, NY 10021
+1 212 288 6400

Washington, D.C.

1779 Massachusetts Ave, NW, Suite 810
Washington, DC 20036
+1 202 833 2742

ABOUT THE EDITORS

Jackson Ewing is Senior Advisor for Sustainability at the Asia Society Policy Institute (ASPI). From 2015 to 2017, he served as ASPI's Director for Asian Sustainability in New York, leading projects on environmental cooperation, responsible resource development, and international climate change policy. He is currently a Senior Fellow at the Nicholas Institute for Environmental Policy Solutions at Duke University, and has worked throughout Asia with actors in government, the private sector, civil society, and international organizations. He holds a doctorate in environmental security and a master's degree in international relations from Bond University, a bachelor's degree in political science from the College of Charleston, and an ongoing fellowship at RSIS.

Minyoung "Minnie" Shin is Senior Program Officer for Sustainability at the Asia Society Policy Institute (ASPI) in New York, where she supports ASPI's climate change and environmental cooperation projects. Before joining ASPI, Minnie worked in the for-profit, public, and nonprofit sectors focusing on issues including environmental markets, climate policy, sustainable operations, and commercial and industrial energy efficiency. She holds a master of public affairs in environmental science and policy from Columbia University and a master of international studies from Seoul National University.

ABOUT THE AUTHORS

Sungwoo Kim is an adjunct professor at Korea University. Before joining Korea University, he was the Regional Head of Climate Change and Sustainability at KPMG Asia Pacific, where he advised public and private decision makers on issues related to carbon pricing, climate finance, and corporate social responsibility. He is also a board member of the International Emissions Trading Association (IETA). He holds a PhD in business administration from Seoul School of Integrated Science of Technology and a master's degree in civil and environmental engineering from Duke University.

Hyung-chan Kim is Director of KPMG Samjong and has more than 12 years of professional experience in climate change and sustainability practices. He advises the Korean government in its development of a legislative framework on carbon market mechanisms, as well as private sector clients on low-carbon strategy and carbon market engagement. He holds a master's degree in environmental studies from Seoul National University, and a bachelor of arts in economics and political science from Sogang University.

Ok-su Lee is Senior Manager of KPMG Samjong. During his 10 years at KPMG, he has advised on establishing effective policy response strategies for companies in various industries such as steel and petrochemicals. He advises the Green Climate Fund (GCF) Secretariat on Accredited Entity (AE) application review as an external technical expert. He holds a bachelor's degree in business administration in accounting and taxation from Kyunghee University and is a Korean Institute of Certified Public Accountants (KICPA) holder.

Yoon-hye Choi is a consultant for KPMG Samjong. Her experience focuses on climate finance and international cooperation on climate change mitigation. She holds a master's degree in international cooperation, with areas of concentration including East Asian studies, and international security and foreign policy from Yonsei University.

This page is intentionally left blank.

CONTENTS

Abbreviations	5
Figure	6
Foreword	7
Executive Summary	9
1. Comparison of Carbon Markets In Northeast Asia	12
1.1. ETSs in Northeast Asia	12
2. Benefits and Challenges of Carbon Market Cooperation from a Business Perspective	15
2.1. Regional Perspective	15
2.2. Country-Level Perspective	16
3. Business Opportunities for Carbon Market Linkage	19
4. Conclusion	22

ABBREVIATIONS

AE	Accredited Entity of the Green Climate Fund
AIIB	Asian Infrastructure Investment Bank
ASPI	Asia Society Policy Institute
BAU	Business-as-Usual
CCERs	Chinese Certified Emission Reductions
CCL	Climate Change Levy
CCS	Carbon Capture and Storage
CNY	Chinese Yuan Renminbi
CO₂	Carbon Dioxide
CPF	Carbon Price Floor
CPS	Carbon Price Support
EC	European Commission
ETS	Emissions Trading System
EU ETS	European Union Emissions Trading System
FY	Fiscal Year
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GtCO₂e	Gigaton of Carbon Dioxide equivalents
GW	Gigawatt
IETA	International Emissions Trading Association
IT	Information Technology
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JVETS	Japanese Voluntary Emissions Trading System
KEPCO	Korea Electric Power Corporation
KETS	Korea Emissions Trading Scheme
KPMG	Klynveld Peat Marwick Goerdeler
KOMIPO	Korea Midland Power
KRW	South Korean Won
LPG	Liquefied Petroleum Gas
M&A	Mergers and Acquisitions
MNC	Multinational Corporation
MOU	Memorandum of Understanding

MRV	Monitoring, Reporting, Verification
MtCO₂e	Megaton of Carbon Dioxide equivalent
MW	Megawatt
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission of China
R&D	Research and Development
RPS	Renewable Portfolio Standard
tCO₂e	Ton of Carbon Dioxide equivalents
TEMM	Tripartite Environment Minister Meeting
TPS	Tradable Performance Standard
TW	Terawatt
UK	United Kingdom
USD	United States Dollar

FIGURE

Figure 1

Comparison of Carbon Markets in China, Japan, and Korea

FOREWORD

PRIVATE SECTOR ACTION IS ESSENTIAL FOR MEETING GLOBAL CLIMATE CHANGE CHALLENGES. In the dynamic economies of Northeast Asia, business sector actors must help governments craft effective carbon market mechanisms that encourage clean growth. This report offers pathways for doing so.

Governments and businesses throughout the world are pricing greenhouse gas emissions as a means for encouraging their reduction. In 2017, national and subnational carbon pricing initiatives covered approximately 15 percent of global emissions with a total value of USD 52 billion. The recently launched Chinese national emissions trading system (ETS) will add another five to seven percent to this coverage. In concert with this government action, more and more major companies the world over are weighing in the cost of carbon on their bottom line.

Carbon markets in Northeast Asia, in particular, are broadening and deepening in scope. China's national ETS is the world's largest, and together with its pilot systems will cover approximately 40 percent of its national emissions when it comes more fully on-board. Entering phase two, the Republic of Korea's ETS is maturing into the core pillar of its climate policy that it was designed to be. Japan, while exploring pathways for implementing a national ETS, continues to use multiple voluntary and mandatory carbon market approaches at subnational and international levels.

As the carbon markets in Northeast Asia evolve and mature, businesses are responding. CDP reports that the number of businesses using an internal carbon price in China, Japan, and Korea rose nearly 65 percent over the past year. Given the myriad ways these companies can affect and be affected by regional carbon market policies, deepening public-private engagement and consultation is essential.

For the past three years, the Asia Society Policy Institute (ASPI) has brought together carbon market thought leaders across Northeast Asia and globally to explore the policy challenges and socioeconomic opportunities of regional carbon market cooperation. This initiative, "Toward a Northeast Asia Carbon Market," seeks to build the foundation from which impactful market connections extend in the future.

This report, developed in collaboration with KPMG Samjong, explores how major companies operating in Northeast Asia can drive carbon market cooperation and capitalize on its opportunities. Market links benefit companies by increasing market liquidity, reducing regulatory uncertainty, offering cost-efficient reduction options, and expanding opportunities for investment in low carbon technologies. However, these benefits vary widely across and within industries. This report asserts that businesses are positioned to help drive a clear policy direction and address competitiveness concerns that could otherwise scuttle linkage possibilities. The report also suggests that private sector stakeholders can target business opportunities that minimize conflicts of interest and create co-benefits across the region. It also offers pathways in which public finance through the Asian Infrastructure Investment Bank and the Green Climate Fund can facilitate carbon market cooperation and accelerate private capital investment in climate change mitigation efforts throughout Asia.

This ASPI initiative springs from the support of many of our institutional and individual partners. For this particular analysis, I would like to thank the experts of KPMG Samjong and ASPI Senior Advisor Dr. Jackson Ewing and Senior Program Officer Minnie Shin for their contribution. And special thanks to the International Trading Emissions Association for regularly providing platforms in which conversations on this important topic can occur, and CDP for partnering with us to bring together private sector stakeholders to our carbon market cooperation dialogues during NYC Climate Week. I would also like to thank the MacArthur Foundation and the Japan Foundation Center for Global Partnership for their support—without which we could not have engaged in this body of work.

Climate change is a great challenge of our time. Governments, businesses, academia, and civil society actors must come together to help us achieve the Paris Climate Agreement goals. I can say with confidence that carbon market cooperation provides an opportunity for such productive cooperation, and ASPI will continue to work toward this goal in the years to come.

The Honorable Kevin Rudd

President, Asia Society Policy Institute
26th Prime Minister of Australia

EXECUTIVE SUMMARY

THE EXPANSION OF CARBON MARKETS IN CHINA, JAPAN, AND KOREA have laid the foundation for discussions on potential carbon market cooperation within Northeast Asia. A carbon market is an artificial commodity market created by the government to value and reflect environmental externalities; by its nature, companies perceive it as a regulation. The role of the private sector (which for this report includes state-owned enterprises) is vital for achieving successful carbon market cooperation in the region. Since the private sector is directly affected by the implementation of an emissions trading system (ETS), it is important to consider how private sector stakeholders would perceive carbon market integration.

This report presents how carbon market linkage within the three Northeast Asian countries of China, Japan, and the Republic of Korea (hereafter, Korea) could occur in concert with industry preferences. The first chapter assesses the carbon market characteristics of Northeast Asia and discusses similarities and differences between systems. The second chapter addresses the potential impacts of carbon market linkage on the private sector. In the third chapter, roles for business leaders are suggested to achieve effective market cooperation and capture new business opportunities that can unlock the potential of private sector investment.

CARBON MARKETS IN CHINA, JAPAN, AND KOREA

While China, Japan, and Korea are taking different approaches in developing their respective carbon markets, there are similarities in their ETS-related experiences. This includes the adoption of mainly free allocation in the initial phase, the use of grandfathering with partial benchmark allocation, and the use of domestic offset credits albeit with restrictions.

The three countries have varying emissions and sector coverage, traded volumes, and price levels, among other differences. The Korea emissions trading scheme (KETS) has the largest national emissions coverage (at 68 percent) and the highest carbon price. Taking into account the sectors covered by the national ETS and the regional pilot systems, emissions covered by the ETS in China are approximately 40 percent in the near term. Since Japan only operates ETSs on the subnational level in Tokyo and Saitama, the coverage is relatively low, accounting for approximately two percent of the country's total national emissions.¹ In terms of the market results to date, the pilot systems in China have the largest traded volume, whereas Japan and Korea have a higher carbon price. How these differences could impact the ETS enterprises and other private sector stakeholders should be considered in advance to further drive market cooperation across Northeast Asia.

OPPORTUNITIES AND CHALLENGES OF CARBON MARKET COOPERATION FROM THE PERSPECTIVE OF PRIVATE SECTOR PLAYERS

Carbon market linkage can yield benefits by increasing market liquidity, reducing risk through price stabilization, and achieving cost-efficient reductions by providing more mitigation options for offsetting GHG emissions. In particular, a multinational company doing business in multiple countries can find cheaper options for meeting its regulatory compliance commitments through access to international credits. Conversely, uncertainty in linked systems creates risk and operational challenges for companies if the framework and rules regarding linkages are unclear.

Potential carbon market linkages will give greater incentives to Chinese companies to invest in reducing GHG emissions, because these actors could sell emission credits to ETS enterprises in Japan and Korea, which have relatively high marginal abatement costs. On the other hand, China may face challenges in meeting its Nationally Determined Contribution (NDC), since linkage would allow some reductions that would be counted toward its NDC target to be transferred and counted as reductions in Korea or Japan. To prevent such problems, governments could limit the volume of transferrable credits to unlock private sector investment in low-carbon technologies while securing their NDC targets.

Without a mandatory nationwide ETS, the benefits of market linkage would be reduced for Japanese firms, since linkage would only be possible at subnational levels. More fundamentally, the absence of a national-level ETS may be a significant obstacle for Japanese companies to actively participate in the carbon market linkage. Even if Japanese companies manage to attain carbon credits by investing in China and Korea, new policies would be necessary for them to use these credits within Japan. One way of enabling utilization is to allow companies under the carbon tax to use such credits obtained from the linkage market to alleviate the carbon tax burden.

Korea has the smallest national carbon emissions and the highest carbon credit prices among the three countries. ETS enterprises in Korea, therefore, may face the largest impact by an integrated carbon market in Northeast Asia. Korean companies can substantially benefit from the increasing liquidity and the price stabilization effect of a regional linkage. This inflow of cheaper carbon credits will benefit the ETS enterprises but would also hamper the growth of companies with business portfolios mainly in low-carbon technology. The introduction of a price floor for carbon prices is a way to alleviate this issue. Another challenge would be that a one-direction inflow of carbon credits and outflow of national wealth could create public opposition to linkage. However, an existing policy in Korea that limits the inflow of emission credits coming from overseas could minimize this problem.

PRIVATE SECTOR ACTION FOR CARBON MARKET LINKAGE

The opportunities for companies from a linked carbon market in Northeast Asia are greater than the drawbacks. This report recommends three actions private sector actors can take to help drive carbon market cooperation in Northeast Asia.

First, companies can proactively suggest restricted linking scenarios that minimize conflicts of interest and create co-benefits for the three countries. Since the power sector accounts for the largest portion of carbon market coverage, it is likely that market linkage in Northeast Asia will begin with it. The power sector has minimal impacts on the trade competitiveness of other sectors such as steel and petrochemicals, since electricity is generally produced and consumed domestically. Moreover, the power sector is one of the major sources of air pollution across Northeast Asia, and cooperation in this sector could deliver large co-benefits.

Second, companies can initiate a cooperative framework to develop business opportunities that involve investment and the participation of businesses across China, Japan, and Korea, as well as the development of carbon offset accounting standards and methodologies. A representative case is a joint project that can resolve both air pollution and GHG emissions resulting from coal-fired power plants. Companies in China, Japan, and Korea can jointly propose technology development and projects that address domestic and

transboundary air pollution to their respective governments. If pursued alongside limited carbon market links, ensuing emissions reductions could be accounted for in shared ways across the three countries.

Another potential joint mitigation project is the development of an interconnected grid system by China, Japan, and Korea in countries such as Mongolia, where the potential for renewable energy power generation is abundant yet underdeveloped. The benefit of the generated electricity could be shared through regional grid links, and emissions reduction credits from the project could be issued to China, Japan, and Korea. Businesses in Northeast Asia are also cooperating to discuss the potential to co-develop an interconnected grid project, which would be bolstered through government support. Carbon market linkage could add value by providing a platform in which companies discuss and develop a methodology for measuring and verifying the emissions reductions of a joint mitigation project.

Finally, companies would benefit from engaging government leaders to request public financing, which is essential in catalyzing large-scale investment in low-carbon projects. Prospective projects that reduce fine dust and GHG emissions from coal-fired power plants would provide public goods in all three Northeast Asian countries, and thus could and should be recognized beyond just their ability to generate profits. A public-private partnership in which the three governments establish a joint fund and crediting arrangement could thus be beneficial. For the grid connection project in Northeast Asia, governments can catalyze private investment by helping firms access development finance through the Asian Infrastructure Investment Bank (AIIB), Green Climate Fund (GCF), and other sources. Such partnerships can facilitate carbon market cooperation and accelerate private capital investment in climate change projects in Northeast Asia and beyond.

CONCLUSION

A linked carbon market in Northeast Asia could benefit covered enterprises, since it provides greater mitigation options to strategically manage their greenhouse gas emissions portfolio and meet their emissions reduction targets. For wider private sector stakeholders, carbon market cooperation can drive business growth and investment in low-carbon technologies.

During the design phase of market linkage, governments should consider creating a linkage framework that provides economic opportunities to companies across Northeast Asia. This framework should seek to prevent the benefits of linkage from becoming concentrated in specific companies, sectors, or subregions. Private sector stakeholders would also have to actively communicate their needs in order for policymakers to provide a clear direction on the linkage framework. The government could also expand the role of private sector engagement by convening firms during the early phases of linkage discussions through a joint platform, and also by regularly collecting opinions from these stakeholders.

For businesses, it is essential to identify the potential challenges linkage would have at the industry level to capitalize on the opportunities. Companies across China, Korea, and Japan could deepen cooperation by developing and implementing projects through mutual cooperation and presenting the challenges and lessons learned to the government. For private sector buy-in and support for linked systems to grow, linkage needs to demonstrate opportunities rather than additional burdens. Such opportunities are essential for ensuring the companies can pursue sustainable growth while contributing to climate change mitigation.

1. COMPARISON OF CARBON MARKETS IN NORTHEAST ASIA

WITH BOTH DOMESTIC AND INTERNATIONAL PRESSURES to improve its environmental conditions, China seeks to lower carbon dioxide (CO₂) emissions per unit of gross domestic product (GDP) by 60 to 65 percent from 2005 levels by 2030.² The ETS is one of China's policy instruments for reducing GHG emissions. In December 2017, China's National Development and Reform Commission (NDRC) launched a national ETS covering the power sector, which will become the world's largest ETS once in operation. Its eight sub-national pilot systems will be integrated into the national ETS as it tests rule and introduces allocation levels during the 2018–2020 period.

Japan has also been utilizing policies with market features to meet its climate goals. Such attempts include the Japanese Voluntary Emissions Trading System (JVETS), J-Credit Scheme,³ Green Power Certificate, and others. At the national level, Japan uses the Tax for Climate Change Mitigation, or Carbon Tax, for domestic reduction, and the Joint Crediting Mechanism (JCM) to gain offsets from supporting reductions overseas. Currently, two sub-national ETSs are operating in Japan, the Tokyo Metropolitan Government Cap-and-Trade Program (Tokyo ETS) and the Saitama Target Setting Emissions Trading System. Japan's Ministry of Environment continues to look for a way to implement a national ETS, but no specific plan has materialized.

Initiated in 2015, the Korea Emissions Trading Scheme (KETS) is at the forefront of the Korean government's climate mitigation policy, covering 68 percent of the country's emissions. It provides a clear signal to domestic entities to consider the economic value of emission reductions in their operations. The KETS continues to evolve and is currently in its second phase. This second phase will introduce auctioning and implement a broader use of benchmarks. It will also allow the use of international offset credits to enhance market liquidity.

Although the ETSs in the three countries differ in terms of regional coverage, it is the only carbon market mechanism shared among the three countries.

1.1. ETSs IN NORTHEAST ASIA

Among the different carbon pricing mechanisms, including ETS, carbon taxation, and crediting mechanisms, ETS is a representative market-based instrument, through which emission units are created and traded to represent emission reductions. In addition, although the ETSs in the three countries differ in terms of regional coverage, it is the only carbon market mechanism shared among the three countries. Therefore, this section elaborates on the structural similarities and differences of the ETSs in China, Japan, and Korea in the search for potential regional market cooperation.

Allowance Allocation

ETSs in China, Japan, and Korea have some similar design characteristics, in part because of the shared lessons they have taken from the European Union Emissions Trading System (EU ETS). This includes allocation methods, where mostly free allocation through grandfathering is used along with partial utilization of benchmarks for new entrants and certain sectors. Small shares of allowances are distributed through auctioning in Japan. For the KETS, auctioning will be introduced in 2019. Although some pilot systems in China have used auctioning for allowances distribution to a limited extent, China's national ETS will employ free allocation during its early stage.

Flexibility Mechanisms

Flexibility mechanisms, such as offset credits and banking and borrowing, are allowed in all three countries to provide additional options in regulatory compliance. Domestic offset credits with qualitative and quantitative limits are available in the pilot systems of China and the KETS, and without limitation in Japan. It is expected that China's national ETS will ultimately accept limited quantities of Chinese Certified Emission Reductions (CCERs) as offset credits.⁴ Korea plans to accept international offset credits issued through Korean companies' activities starting in Phase Two. The Tokyo ETS accepts four types of offset credits: small and mid-size facility credits, outside Tokyo credits, renewable energy credits, and Saitama credits via linking (excess credits and small and mid-size facility credits). In the case of the Saitama ETS, offset credits similar to the Tokyo ETS are accepted, with an addition of Forest Absorption Credits.

Banking credits across compliance periods are allowed, while borrowing is not in China and Japan; in Korea, borrowing is allowed with limits within a single phase. In China, all pilot systems allow banking during the pilot period, but not borrowing. In the Tokyo ETS, banking is allowed between two compliance periods, but borrowing is not allowed. Initially, banking was allowed without restrictions between phases in the KETS. However, in 2017, the Korean government placed a restriction on banking to prevent ETS enterprises from excessively carrying over their allowances. Borrowing, on the other hand, was increased from 10 percent to 20 percent within a single phase.

Emissions and Sector Coverage

The KETS has the widest emissions and sector coverage. Emissions covered by the ETS in Korea account for 68 percent of its total national emissions, and the sectors covered are defined in a relatively detailed manner—23 subsectors from both manufacturing and power sectors, namely steel, cement, petrochemical, oil refinery, power, buildings, waste, and aviation sectors.

In China, at the regional pilot level, several manufacturing sectors including electricity, petrochemical, iron and steel, nonmetal processing, nonferrous metals, and cement are covered by the various ETSs. However, the national ETS only covers the power sector during the initial stage, which accounts for roughly one-third of the total emissions in China. Taking into account the sectors covered by the regional pilot systems and the national ETS, approximately 40 percent of emissions are covered by ETS in China in the near term with questions remaining on how the pilot and national systems will be synthesized.

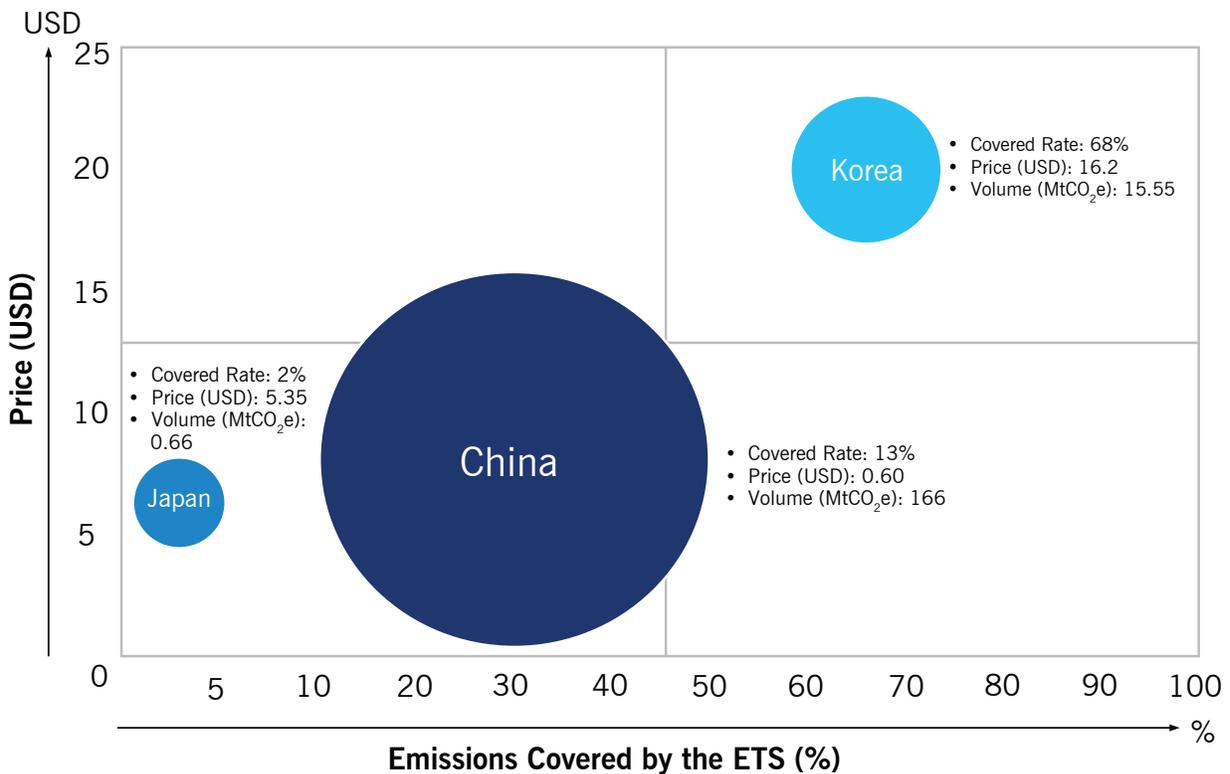
Emissions covered by the ETSs of Tokyo and Saitama account for two percent of Japan's total emissions. In addition, unlike China and Korea where the accounting boundary for emissions is set at the company level, a liable entity in Japan is defined as a single facility.

Traded Volume and Price

Carbon prices are highest in Korea, with an average of USD 16.20 per tCO₂e.⁶ In China, prices for carbon credits differ among the eight regions where pilot systems are operating, with a range of USD 0.42 to USD 7.56 per tCO₂e. Prices of excess credits in Japan are between USD 3.57 to 7.14 per tCO₂e (in 4Q2017), and the carbon price is not a market price but is determined through negotiation.⁷

Accumulative traded volume in Korea was 15.55 MtCO₂e between 2015 and 2017, which is approximately one percent of the total cap.⁸ In China, 166 MtCO₂e, approximately 20 percent of the total tradable volume, was traded in the eight regional pilot systems between 2013 and 2017.⁹ The total trade volume of Japan was 0.66 MtCO₂e between 2010 and 2017 (see Figure 1).¹⁰

FIGURE 1. COMPARISON OF CARBON MARKETS IN CHINA, JAPAN, AND KOREA



Note:

* China: Pilot systems in eight regions; Japan: Tokyo and Saitama ETSs; Korea: KETS.

* The size of each bubble represents the accumulative traded volume of each carbon market (China: 2013–2017, Japan: 2010–2017, Korea 2015–2017).

Source: Created by KPMG from publicly available information: International Carbon Action Partnership, “ETS Detailed Information for KETS, TMG ETS, Saitama ETS, Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhen, Tianjin Pilot System,” December 14, 2017, <https://icapcarbonaction.com/en>. Korea Exchange, “Market Data of Emission Trading System,” <http://open.krx.co.kr> (as of December 14, 2017). Bureau of Environment (Tokyo Metropolitan Government), “Emissions Trading Record” (in Japanese), December 2017. Bureau of Environment (Tokyo Metropolitan Government), “Assessment Result of Transaction Price” (in Japanese), December 29, 2017, www.kankyo.metro.tokyo.jp/climate/large_scale/trade.html#kakakusatei. Partnership for Market Readiness (PMR), “China Carbon Market Monitor,” No. 9, 2Q2017.

2. BENEFITS AND CHALLENGES OF CARBON MARKET COOPERATION FROM A BUSINESS PERSPECTIVE

CARBON MARKETS IN CHINA, JAPAN, AND KOREA HAVE DIFFERENT CHARACTERISTICS; therefore, differences exist in the levels of coverage and impact on their respective private sector stakeholders. Moreover, businesses in Northeast Asia are interconnected. Companies of various sizes, including multinationals (MNCs) in each country, do business in neighboring countries and at times establish partnerships with local enterprises. For example, 33,390 Japanese companies¹¹ and 26,735 Korean companies¹² do business in China, equivalent to 12.5 percent of all foreign-invested enterprises in the country.¹³ In Korea, about 3,000 Chinese companies and about 3,100 Japanese companies have entered the market, accounting for 34 percent of all foreign-invested enterprises. And numerous Korean and Chinese companies also operate in Japan.¹⁴ Given such interconnection, before examining the country-level implications of carbon market linkage, it is necessary to review how carbon market connectivity would affect the private sector actors across the region.

2.1. REGIONAL PERSPECTIVE

The first benefit of linking the carbon markets in Northeast Asia is an increase in liquidity. If carbon credits are considered as goods with monetary values, as with other commodities, the size of the market in which the carbon credits are traded is one of the most important factors for market stability. This implies that a market has to be of a size that the private sector can trade at any time and rely on to find cheaper emissions reduction options. Switzerland's ETS, for example, is linked with the EU ETS to increase the liquidity of its own market. This has provided the private sector with more opportunities to secure carbon

If the implementation of a national ETS of China's power sector is added, the size of the linked market could increase to around 5 GtCO₂e annually, which is three times the size of the EU ETS.

credits. Currently, a total volume of about 2 GtCO₂e carbon market¹⁵ can be formed per year if the ETSs in Northeast Asia are linked. If the implementation of a national ETS of China's power sector is added, the size of the linked market could increase to around 5 GtCO₂e annually,¹⁶ which is three times the size of the EU ETS.¹⁷

Second, there may be a stabilizing effect on carbon credit prices, which would have a large impact on the investment decisions of the private sector. The carbon prices would also affect the decision making processes of companies including investment decisions on new equipment and facilities, mergers and acquisitions

(M&A), and mortgages related to carbon credits. A company facing carbon price volatility will have to make conservative decisions regarding low-carbon investment as companies usually make investment decisions based on the worst-case price scenarios. Of course, carbon market linkage by itself does not guarantee the stability of the carbon credit price, since it is also affected by the intensity of the government

regulation and the marginal abatement cost of the private sector. Nonetheless, the expansion of the supply and demand through market linkage could be effective in preventing sudden price fluctuations.

Finally, an MNC operating in the region can benefit from lower abatement costs and noncompliance risks. Currently, the GHG emissions reduction regulations of the three countries differ; thus, additional administrative costs are incurred to understand and respond to the regulations. Carbon market linkage can alleviate this issue, as MNCs can invest in the most cost-effective mitigation options internally, based on the business conditions they face in each country. These companies can then flexibly respond to changing conditions through the transfer of carbon credits between business sites in each country.

Challenges

The absence of a clear policy direction on carbon market linkage creates systematic uncertainties for companies and discourages active participation in the process. Carbon market linkage can be broadly categorized into full linking, restricted linking, and indirect linking.

Full linking of ETSs in Northeast Asia is unlikely in the near term given the differences in coverage of industries and regions, level of emissions, allowance size, and carbon price. A national-level linkage would first require China to expand its ETS coverage to sectors beyond the power sector, and for Japan, a mandatory national ETS first needs to be introduced.

It is possible to consider pilot linkages on the subnational level. However, since China and Korea allocate and manage their ETSs at the national level, it becomes essential to assess what the implications of linking specific provinces and/or cities would be on their respective national ETSs. To minimize the negative impact, trading of offset credits may be discussed prior to the trading of allowance credits. In addition, there may be a way for China and Korea to link their national ETSs first and then move to include Japan, when it introduces a national ETS.

Unless the three governments present clear plans for carbon market linkage, policy uncertainty may pose the greatest risk in complying with regulations and seeking new business opportunities.

Indirect linking may be the most feasible option for the near future. Among the most important issues for the private sector are monitoring, reporting, and verification (MRV) and allocation methods for carbon credits. For the private sector businesses to secure credits from other countries and transfer them to their own countries, discussions on how to apply MRV rules for carbon credits among the three countries are needed. For projects jointly invested by the private sectors in Northeast Asia, discussions also need to take place on how to allocate the carbon credits.

Unless the three governments present clear plans for carbon market linkage, policy uncertainty may pose the greatest risk in complying with regulations and seeking new business opportunities. Discussions must also resolve how to apply exchange rates to the carbon credits—whether to apply an exchange rate or come up with separate measures.

2.2. COUNTRY-LEVEL PERSPECTIVE

China

Because of China's larger scale, regional carbon market linkage would have smaller impacts on Chinese companies than those in Japan and Korea. However, since a national ETS in China will only cover the power sector in its initial stage and will broaden to cover more sectors in the future, impacts on China's carbon market will be larger in the short term compared to when it covers more industrial sectors.

Carbon market linkage will provide additional incentives for Chinese firms to actively invest in reducing GHG emissions. Since the prices of carbon credits in the pilot systems are lower than the price in Korea, ETS linkage may lead to price increases in China due to supply and demand intersections with different marginal abatement costs across the three countries. As a business decision to invest in GHG emissions reduction is closely related to the price of carbon credits, in China, investments for emissions reduction could increase under a linked carbon market.

Even though an increase in the price of carbon credits can facilitate low-carbon investment for companies without obligations, companies that are regulated under the Chinese ETS will face a high risk

Companies with surplus carbon credits can sell them in other carbon markets and profit from selling them to a market with higher market value. However, the impact can be minimal since the Japanese carbon market is relatively smaller than that in China and Korea.

of increased cost of complying with regulations. In the long run, an increased cost of compliance will motivate Chinese companies to develop interest abatement technologies. However, to lower short-term market impacts and encourage the private sector to perceive carbon market linkage as an opportunity for new business, not as an expansion of risks related to regulations, the Chinese government may have to provide a measure for liable entities to obtain carbon credits and seek business opportunities at the same time.

If carbon credits from China are transferred to Korea or Japan, the Chinese government could decide to impose a more stringent cap to ensure domestic reductions goals are met. To prevent such problems, it is necessary for the government to limit the volume of transferrable credits to unlock private sector investment in low-carbon technologies while

securing its NDC target. As carbon credits are expected to flow from China to Japan and Korea, setting a cap for accepting international carbon credits by the governments of Japan and Korea will have a similar effect from the opposite direction.

Japan

Since Japan does not have a national ETS nor a concrete plan to establish one, carbon market linkage would only be possible at the level of prefecture or city in the short term. As the ETS in Japan only applies to companies in Tokyo and Saitama Prefecture, market linkage is expected to have the smallest impact on Japanese firms in the short term, unless a framework to include companies from other regions of Japan is established.

Companies with surplus carbon credits can sell them in other carbon markets and profit from selling them to a market with higher market value. However, the impact can be minimal since the Japanese carbon market is relatively smaller than that in China and Korea. On the other hand, if the three governments establish a joint climate mitigation project in a different country through the JCM, Japanese companies could utilize the credits to meet their domestic emissions reduction obligations.

Since Japan only operates ETSs on the subnational level, the benefits of linkage may not match the administrative costs. More fundamentally, the absence of a national ETS will be the greatest obstacle to facilitating active participation of Japanese companies in a Northeast Asian carbon market: even though Japanese companies are able to purchase carbon credits from the linked market, there is no current pathway for utilizing carbon credits within Japan. It will be necessary to formulate such a pathway in Japan to facilitate private sector participation. In the short term, it might be possible to link Japan's carbon tax to China's and Korea's ETSs. The Japanese government could consider allowing emissions credits from China and Korea to be used in carbon tax reductions. In Denmark and the United Kingdom (UK), tax reductions are provided to resolve the issue of double regulation; a measure Japan could explore.¹⁸

In the medium to long term, linking the three carbon markets can be realized when Japan establishes a national ETS. To encourage carbon market linkage, China and Korea—where national-level ETSs have already been established—could link their ETSs first. This early stage linkage between China and Korea would provide experience in cooperation and might encourage Japan to establish a national ETS and participate in the linkage.

Korea

Korean companies will be the largest beneficiaries of liquidity expansion and price stabilization among the three countries. Liable entities can reduce compliance costs by trading carbon credits at a lower price in China. Korean companies have expressed that investment in low-carbon technologies has not been promoted because the marginal abatement cost in Korea is higher than the price of carbon credits, even though Korea's carbon price is the highest among the three countries. Yet, the price of carbon credits does not seem to be affected by the law of supply and demand of the market. One of the several reasons for this is that companies with credit surpluses are banking their credits due to uncertainty in regulations and the risk of damaging their public image. Since China's carbon market is relatively liquid and has lower marginal abatement costs, linking with the Chinese market will provide additional options for Korean firms to meet their mitigation targets.

Since China's carbon market is relatively liquid and has lower marginal abatement costs, linking with the Chinese market will provide additional options for Korean firms to meet their mitigation targets.

On the other hand, Korean companies may also face the largest potential drawbacks. For companies that are required to comply with emissions regulations, carbon market linkage will be beneficial. On the other hand, for companies with business portfolios in abatement technologies, linkage may challenge their business as emissions reduction options become available. As a result, linkage may deter further investment

in renewable energy and energy efficiency projects in Korea as well as research and development and investment in abatement technologies. Although the renewable portfolio standard (RPS) could have a buffering effect, it is likely that investment in low-carbon projects and technologies will shrink.

Policies should be established to prevent such problems from occurring. For example, the UK implements a Carbon Price Floor (CPF) to maintain the price of carbon credits above a certain price. The CPF is an instrument to eliminate uncertainty in the price of carbon that enabled the UK to facilitate investment in renewable energy and low-carbon technologies.¹⁹ Such policies will lower price fluctuation and may remove the risk of discouraging investment in abatement technologies.

Korea has a high demand for cheaper emissions credits since its carbon price is the highest among the three countries. A one-direction inflow of carbon credits and outflow of national wealth could create public opposition to linkage. Such issues can be resolved by the existing policy that limits the amount of credits from overseas. Currently, companies regulated by the KETS are allowed to use domestic credits from external reductions implemented by non-ETS entities to offset their emissions with a maximum of 10 percent of the total allowances. International offsets can be used as offsets within the five percent limit beginning in 2021.²⁰ By properly modifying this policy in accordance with changes of circumstances, concerns about outflows of national wealth would be resolved. This policy could also bring positive effects on the achievement of China's NDC targets by preventing excessive transfer of carbon credits from China to Korea.

3. BUSINESS OPPORTUNITIES FOR CARBON MARKET LINKAGE

ANY REGIONAL LINKAGE FRAMEWORK SHOULD ADDRESS industry-level emissions reduction since different industries face different challenges. And in order to facilitate cooperation in Northeast Asia, programs should relate to the interests of both private and public sector stakeholders.

Among the industries affected by carbon markets, the electrical power sector emits the largest amount of GHGs in all three countries. It is also the first industry to be included in the national ETS of China. In Korea, the power sector cap in 2018 accounts for 45 percent of the total allowances followed by steel, petrochemical, cement, and the oil-refining sectors.²¹ In case of Japan, the power sector is responsible for 38 percent of the country's emissions.²²

In addition, cooperation in the power sector might be easier than in other sectors, since production and consumption of power take place domestically and could face less conflict of interest than in other sectors. For companies in manufacturing industries, competitiveness is a major concern since impacts of carbon market linkage may differ at the company level. The power sector, on the other hand, could be relatively free from competitive concerns since it is an industry exclusively for domestic demand.

Cooperation in the power sector might be easier than in other sectors, since production and consumption of power take place domestically and could face less conflict of interest than in other sectors.

The following private sector actions for driving carbon market linkage are not limited to the power sector. However, the power sector could take the lead in carbon market linkage, considering the level of impacts, urgency, and feasibility. First, private sector players could recommend that governments begin carbon market linkage with the power sector. Second, a project that creates business opportunities could be developed for investment and participation of companies and financial institutions from the three countries, and a methodology for carbon credit generation could then be jointly developed. The examples of such projects are further elaborated in the subsections that follow. Lastly, companies could jointly request public finance through development banks to facilitate private investment in low-carbon projects. The support could be in the form of alleviating investment risks and building relevant infrastructure. Proposing detailed funding measures that could be linked to the business programs would enhance the feasibility of such projects.

Addressing Transboundary Air Pollution

Northeast Asia is heavily dependent on fossil fuels including coal power plants to fulfill rising power demand in the short term. In China, along with high levels of carbon emissions, coal generation has been held responsible for about 40 percent of the fine dust in its atmosphere.²³ Approximately 34 percent of

Korea's fine dust particles come from China,²⁴ and the Ministry of Environment of Japan suggested that 40 to 70 percent of the fine dust particles in Japan originate from China and Korea.²⁵ While the high concentration of fine dust in China crosses over to its neighboring countries, Japan and Korea face similar problems from domestic coal-fired plants and vehicles.

Each of the three countries is taking measures to mitigate the negative impacts of fine dust particles.²⁶ A consensus regarding the seriousness of transboundary air pollution and fine dust problem within the region has led to multilateral and bilateral efforts for resolving the issue. One example is the Tripartite Environment Minister Meeting (TEMM), where the environment ministers of China, Japan, and Korea have been meeting annually since 1999 to discuss cooperative measures for resolving environmental issues within the region, including yellow dust and air pollution.²⁷

The evidence that air pollution is a shared challenge in Northeast Asia is clear. And given that much of the CO₂ and fine dust particles share similar origins, namely, power generation from coal, a joint effort to develop a technology that can connect carbon capture and storage (CCS) technology with dust collection technology to reduce CO₂ and air pollutants could contribute to solving this challenge. Also, installing such equipment would improve air quality of the three countries and secure carbon credits in a linked

Reducing fine dust and GHG emissions from coal-fired power plants would yield public goods in all three countries that warrant valuations beyond just profit generation.

market. Research for both carbon-capturing and dust-collecting technologies has been underway, and some companies have been making efforts to commercialize such technologies to resolve the issues of CO₂ emissions and fine dust. For instance, Korea Midland Power (KOMIPO), a public energy enterprise in Korea has been operating a 10 megawatt carbon-capturing system since 2013, and is currently installing carbon storage system to utilize the emitted CO₂.²⁸

technologies to the point where they could become commercialized. Participation of the public sector will be needed, as ways for funding have to be planned because cooperation among the three countries goes beyond joint research and development and extends toward an actual project that induces participation of the private sector.

The private sector could begin searching for possible locations for project development, carry out pilot projects, and continue with research and development to create CCS and dust collection

Reducing fine dust and GHG emissions from coal-fired power plants would yield public goods in all three countries that warrant valuations beyond just profit generation. Limits exist in the enlargement of such projects through private sector investments, creating a need for public financing and incentive structures. Considering the urgency of the issue, a joint fund established by the three governments is a possible option. By proposing a financing structure whereby the private sector can invest and obtain carbon credits, the private sector actors will be able to participate in the project not only as project implementers but also as investors.

Spurring Clean Energy Investment

In the aftermath of the Fukushima nuclear crisis in March 2011, a Japanese telecommunications and Internet corporation (Softbank) suggested a shift from nuclear power to safer and cleaner renewable energy through connecting Northeast Asian countries through a super grid. Its proposed plan was to expand the regional horizon to include Southeast Asia and India as participants in the super grid.²⁹ In developing the idea, Softbank; State Grid Corporation of China; Korea Electric Power Corporation; and Rosseti, a Russian electric power and grid operator, came together to sign a memorandum of understanding (MOU) for technical and financial feasibility studies for the Northeast Asian Super Grid project in March 2016.³⁰ Based on the MOU, further cooperation is planned to develop renewable energy power generation in Mongolia and Russia, construct interconnected transmission lines, and propose governments for regional cooperation.

Construction of an interconnected power grid in Northeast Asia (hereinafter, the Northeast Asian Super Grid) and allowing trade of the credits issued through this Northeast Asian Super Grid could promote energy independence and establish a foundation for carbon market cooperation in the region. The basic concept of this super grid is to construct renewable energy power plants in countries where renewables are abundant (e.g., Russia and Mongolia) and supply the electricity generated to countries where power demands are high (e.g., China, Japan, and Korea). A recent analysis illustrates that the potential for wind and solar energy from the Gobi Desert accounts for more than 3 TW.³¹ This amount is more than sufficient to cover all of the three countries' current power capacities, which add up to 1,906 GW.³²

The super grid is currently being discussed as a platform to expand renewable energy in Northeast Asia, and the initial feasibility study is being undertaken. In order to increase the viability and maximize the impact, linking the project with carbon market linkage and climate finance seems necessary. Furthermore, the private sector may be able to contribute to this process by proposing to the three governments to establish the legal and institutional foundations for utilizing the linking mechanism for their carbon markets.

In terms of financing, since the prospective project would take place in developing countries such as Mongolia, and also is a GHG mitigation project, financing from the Green Climate Fund (GCF), Asian Infrastructure Investment Bank (AIIB), or other public financial institutions would help attract private investment. The GCF can be considered first, as the three countries are closely involved in the operation of the fund: it is located in Korea, and China and Japan serve as board members. The GCF has been playing a role as an anchor investor that takes risks for projects that contribute to the paradigm shift toward a low-carbon society; a financing structure where the accredited entities of the GCF take the lead in investment and the private players from the three countries participate could be designed and proposed. Moreover, entities from China, Japan, and Korea have been accredited by the GCF to channel the Fund's resources to projects and programs.³³ Such entities could cooperate to design and plan a Northeast Asia Super Grid program.

Construction of an interconnected power grid in Northeast Asia (hereinafter, the Northeast Asian Super Grid) and allowing trade of the credits issued through this Northeast Asian Super Grid could promote energy independence and establish a foundation for carbon market cooperation in the region.

4. CONCLUSION

TALKS ON CARBON MARKET COOPERATION IN NORTHEAST ASIA WILL CONTINUE TO GAIN MOMENTUM as China's national ETS matures. Successful carbon market cooperation in Northeast Asia would allow the three countries to achieve cost-efficient reductions and contribute to establishing mitigation goals that are more ambitious. From the perspective of private sector stakeholders, carbon market linkage could be beneficial, since it would provide cheaper mitigation options through access to international credits, create additional business opportunities for companies with low-carbon technologies, and offer pathways for spurring the development and investment in joint climate change projects.

When designing the linkage framework, policymakers should seek designs that allow companies from all three countries to be provided with opportunities to seize the economic gains and avoid benefits of linkage

For private sector buy-in and support for linked systems to grow, the linkage framework needs to demonstrate opportunities rather than additional burdens.

from becoming concentrated in a selective sector or country. The governments can also expand the role of businesses by engaging them during the early phases of linkage discussions through a joint platform, and also by regularly collecting opinions from private sector stakeholders.

For private sector stakeholders, it is essential to identify the potential challenges of linkage at the industry level to capitalize on opportunities. Corporations across China, Korea, and Japan can deepen cooperation by developing and implementing

projects through mutual cooperation, and present the challenges and lessons learned to the government. For private sector buy-in and support for linked systems to grow, the linkage framework needs to demonstrate opportunities rather than additional burdens. Such opportunities are essential for ensuring that the companies can pursue sustainable growth while contributing to climate change mitigation.

This page is intentionally left blank.

ENDNOTES

¹ No information has been made public regarding the price of Saitama ETS; however, it is assumed that the price is similar to that of Tokyo ETS, given that the two systems are linked. Source of the price of Tokyo ETS: Argus, “About the assessment result of the total amount reduction obligation and the emissions trading system transaction price,” December 11, 2017, www.kankyo.metro.tokyo.jp/climate/large_scale/siryoku3_percent20sateikakaku201712.pdf.

² The World Bank, “State and trends of carbon pricing 2017,” https://openknowledge.worldbank.org/bitstream/handle/10986/28510/wb_report_171027.pdf?sequence=5&isAllowed=y.

³ Credits certified by the Japanese government based on the amount of GHG emissions reduced or removed through efforts to introduce energy-saving devices and managing forests.

⁴ International Carbon Action Partnership, “China,” accessed January 19, 2018, <https://icapcarbonaction.com/en/ets-map>.

⁵ The currency exchange rates of CNY, JPY, and KRW to USD used in this report are the annual average of each currency rate in 2017 (USD 1 equals CNY 6.75, JPY 112.13, and KRW 1,130). Source: Woori Bank, “Foreign Exchange Rate,” accessed January 18, 2017, <https://spot.wooribank.com/pot/Dream?withyou=FXXRT0016>.

⁶ Korea Exchange, “Market data.”

⁷ Argus, “About the assessment.”

⁸ Korea Exchange, “Market data.”

⁹ Partnership for Market Readiness (PMR), “China.”

¹⁰ Bureau of Environment (Tokyo Metropolitan Government), “Emissions Trading Record” (in Japanese), December 2017, http://www.kankyo.metro.tokyo.jp/climate/large_scale/trade/index.files/siryoku2-1_jisseki-ikou201712.pdf, Saitama Prefecture, “Information on Emissions Trading” (in Japanese), May 2017.

¹¹ Choongyu Lee, “Japanese companies accelerate to extend its businesses to China more than ever” (in Korean), *Yonhap News*, August 19, 2016, www.yonhapnews.co.kr/bulletin/2016/08/19/0200000000AKR20160819077200009.HTML.

¹² Korea Exim Bank, “Foreign investment statistics” (in Korean), accessed January 19, 2018, <https://stats.koreaexim.go.kr/odisas.html>.

¹³ National Bureau of Statistics of China, “Registration status of foreign funded enterprises by sector at year-end (2015),” accessed January 19, 2018, www.stats.gov.cn/tjsj/nds/2016/indexeh.htm.

¹⁴ Ministry of Trade, “Industry and energy, registration status of foreign-invested enterprises” (in Korean), accessed January 19, 2018, www.motie.go.kr/motie/in/it/companyguide/companyguide.jsp.

¹⁵ The volume the total of caps of currently operating ETs in China, Japan, and Korea based on publicly available information. Sources: Sources: International Carbon Action Partnership, “ETS Detailed Information for KETS, TMG ETS, Saitama ETS, Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhen, Tianjin Pilot System,” December 14, 2017, <https://icapcarbonaction.com/en>.

¹⁶ It is estimated that the cap for China’s ETS will be around 3.3 GtCO₂e per year. Source: International Carbon Action Partnership, “ETS detailed information for China,” accessed January 19, 2018, <https://icapcarbonaction.com/en/ets-map>.

¹⁷ European Environment Agency, “EU Emissions Trading System (ETS) data viewer,” accessed January 24, 2018, www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1. The size of the EU ETS was approximately 1.7 GtCO₂e in 2016.

¹⁸ The Danish government applies differentiated tax rates based on the following two principles: (1) the intensity of energy use and (2) whether a company has signed a voluntary carbon emissions reduction agreement. The special clause on provision of tax reduction to companies that sign the voluntary carbon emissions reduction agreement has induced companies to actively participate in the cap-and-trade system. The UK government’s Climate Change Agreement scheme lets companies voluntarily decide on detailed targets for increasing energy efficiency and reducing CO₂ emissions. Companies that hold an agreement are eligible for discount on the Climate Change Levy (CCL), an energy tax imposed on

UK businesses. Sources: Sangchul Shin and Hyunju Park, “A Study on the Feasibility of a Policy Mix in Reducing GHG Emissions in Korea” (in Korean), the Korea Environment Institute, December 2011, <http://kiss.kstudy.com/thesis/thesis-view.asp?key=3186204>, Climate Change Levy, “CCL Discount Scheme,” accessed March 09, 2018, <http://www.cclevy.com/page/91/CCL-Discount-Scheme.htm>.

¹⁹ The gap between the CPF and the EU ETS carbon price is filled with the Carbon Price Support (CPS). The CPS is charged through a part of the CCL, a tax imposed on gas, solid fossil fuels, and liquefied petroleum gas (LPG) and added on top of the prices of the EU ETS allowances.

²⁰ ICAP Korea Emissions Trading Scheme, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems_percent5B_percent5D=47.

²¹ Jihae Shim, “Government announced lower emissions reduction credits than expected, belatedly” (in Korean), *newspim*, December 19, 2017, www.newspim.com/news/view/20171219000121.

²² National Institutes for Environmental Studies, “National Greenhouse Gas Inventory Report of JAPAN (2017),” https://www.env.go.jp/earth/ondanka/ghg-mrv/unfccc/material/NIR-JPN-2017_E.pdf.

²³ Edward Wong, “Coal burning.”

²⁴ Da-sol Kim, “Half of fine dust from Korean sources: Study,” *The Korea Herald*, July 19, 2017, www.koreaherald.com/view.php?ud=20170719000994.

²⁵ Government of Korea, “A comprehensive.”

²⁶ In 2013, China’s State Council issued an Action Plan on Prevention and Control of Air Pollution, through which it aims to achieve a 25 percent reduction of annual mean particulate matter 2.5 (PM2.5) concentrations for the Beijing-Tianjin-Hebei region. In the same year, Japan’s Ministry of Environment announced the Comprehensive Package against Fine Dust outlining action plans for monitoring fine dust status and reducing fine dust emissions. In September 2017, the Korean government announced the Comprehensive Measure for Fine Dust Control with a 30-term target of reducing fine dust emissions by 30 percent from 2016 levels by 2022. Sources: Zheng Jinran, *China Daily*, August 26, 2017, www.chinadaily.com.cn/china/2017-08/26/content_31131288.htm, Soochol Lee, “Japanese measurement on fine particles (PM2.5) emission,” Government of Korea, “A comprehensive.”

²⁷ Ministry of Environment of Korea, “Bilateral and multilateral environmental cooperation,” accessed January 19, 2018, eng.me.go.kr/eng/web/index.do?menuid=422.

²⁸ Jaeho Lee, “Korea Midland Power Co, Reduce 75 Percent of Air Pollute Emission” (in Korean), *Naeil*, September 25, 2017, http://www.naeil.com/news_view/?id_art=251960.

²⁹ Gyujae Jeong, “Trend of major super grid projects and its implications” (in Korean), *World Energy Market Insight* 16 (2017), http://www.keei.re.kr/main.nsf/index_mobile.html?open&p=%2Fweb_keei%2Fpendingissue.nsf%2Fxmmain4%2F7BBD725D2595BC304925811F00343D8C&s=%3FOpenDocument.

³⁰ Junko Movellan, “The Asia super grid – four countries join together to maximize renewable energy,” *Renewable Energy World*, October 18, 2016, www.renewableenergyworld.com/articles/2016/10/the-asia-super-grid-countries-join-together-to-maximize-renewable-energy.html.

³¹ Yongbum Park and Sewoong Kim, “Will ‘grid interconnection.’”

³² Current power capacities of the three countries are: China, 1,508 GW (in 2015), Japan, 292 GW (in 2015), and Korea, 106 GW (in 2016). Sources: Jungin Kim, “China’s 2015,” Ministry of Internal Affairs and Communications, “Japan Statistical,” Ministry of Trade, Industry and Energy, “Eighth basic plan.”

³³ The accredited entities include China’s Clean Development Mechanism Fund Management Center, Japan’s Bank of Tokyo-Mitsubishi UFJ, and Korea’s Development bank.

For more content related to this report, visit
AsiaSociety.org/BusinessSectorCarbonAction

Other Asia Society Policy and Business Reports

Shifting Trade Winds: U.S. Bilateralism & Asia-Pacific Economic Integration

Northeast Asia and the Next Generation of Carbon Market Cooperation

Preserving the Long Peace in Asia

The Trump Administration's India Opportunity

Charting a Course for Trade and Economic Integration in the Asia-Pacific

Advice for the 45th U.S. President: Opinions from Across the Pacific

Roadmap to a Northeast Asian Carbon Market

India's Future in Asia: The APEC Opportunity

Avoiding the Blind Alley: China's Economic Overhaul and Its Global Implications

High Tech: The Next Wave of Chinese Investment in America

Sustaining Myanmar's Transition: Ten Critical Challenges

Chinese Direct Investment in California

Delivering Environmentally Sustainable Economic Growth: The Case of China

Advancing Myanmar's Transition: A Way Forward for U.S. Policy

An American Open Door? Maximizing the Benefits of Chinese Foreign Direct Investment

Pakistan 2020: A Vision for Building a Better Future

Current Realities and Future Possibilities in Burma/Myanmar: Options for U.S. Policy

North Korea Inside Out: The Case for Economic Engagement



Preparing Asians and Americans for a Shared Future

Asia Society is the leading global and pan-Asian organization working to strengthen relationships and promote understanding among the people, leaders, and institutions of Asia and the United States.

We seek to increase knowledge and enhance dialogue, encourage creative expression, and generate new ideas across the fields of policy, business, education, arts and culture. Founded in 1956, Asia Society is a nonpartisan, nonprofit educational institution with offices in Hong Kong, Houston, Los Angeles, Manila, Mumbai, New York, San Francisco, Seoul, Shanghai, Sydney, Washington, D.C., and Zurich.

COVER IMAGE: Solar power, Shanghai 8065, Jeff Hu/Content/iStock