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REPORT

Northeast Asia and the Next Generation of Carbon Market Cooperation

Jackson Ewing and Minyoung Shin

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AND
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ABBREVIATIONS

ASPI	Asia Society Policy Institute
BAU	Business as Usual
CCER	China Certified Emissions Reduction
CCRK	Climate Change Research Institute of Korea
CDIAC	Carbon Dioxide Information Analysis Center
CDM	Clean Development Mechanism
CH_4	Methane
CNY	China Yuan Renminbi
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPLC	Carbon Pricing Leadership Coalition
EAAC	Emission Allowance Allocation Committee
EITE	Energy-intensive and Trade-exposed
ETS	Emissions Trading System
EU	European Union
EU ETS	European Union Emissions Trading System
FIT	Feed-in-tariff
GCP	Global Carbon Project
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOJ	Government of Japan
$GtCO_2$	Gigatons Carbon Dioxide
HFCs	Hydrofluorocarbons
ICAP	International Carbon Action Partnership
IETA	International Emissions Trading Association
IGES	Institute for Global Environmental Strategies
IMMs	International Market Mechanisms
JPAs	Japanese Emissions Allowances
J-VER	Japan Verified Emissions Reduction
JC	Joint Committee
JCM	Joint Crediting Mechanism
JPY	Japanese Yen
JVETS	Japan Voluntary Emissions Trading Scheme
KAU	Korean Allowance Unit
KCER	Korea Certified Emissions Reduction

KETS	Korea Emissions Trading Scheme
KRW	Korea (South) Won
KVER	Korea Voluntary Emissions Reduction
LCGG	Low Carbon Green Growth
LNG	Liquefied Natural Gas
LULUCF	Land Use, Land-use Change, and Forestry
MEP	Ministry of Environmental Protection
METI	Ministry of Energy, Trade, and Industry
MOA	Ministry of Agriculture
MOC	Ministry of Commerce
MOE	Ministry of Environment
MOF	Ministry of Finance
MOTIE	Ministry of Trade, Industry and Energy
MOSF	Ministry of Strategy and Finance
MRV	Measurement, Reporting, and Verification
Mt	Metric Tons
$MtCO_2e$	Metric Tons of Carbon Dioxide Equivalent
N2O	Nitrous Oxide
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OTC	Over-the-counter
PCGG	Presidential Committee on Green Growth
PFC	Perfluorinated Compound
PM2.5	Particulate Matter 2.5
SF6	Sulfur Hexafluoride
SOE	State-owned Enterprise
TCE	Metric Tons of Coal Equivalent
TMG	Tokyo Metropolitan Government
TMS	Greenhouse Gas and Energy Target Management System
TPS	Tradable Performance Standard
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VA	Voluntary Agreement

FIGURES AND TABLES

FOREWORD

ASIA MUST LEAD THE GLOBAL FIGHT AGAINST CLIMATE CHANGE. Two years on from the landmark Paris Agreement, 2017 has seen rebounding growth in greenhouse gas emissions and warming temperatures, severe weather, and destroyed livelihoods that have become the new normal.

As the Trump administration seeks to extract the United States from global climate commitments, at least at the national level, it is more important than ever for Northeast Asia to lead the next generation of climate change responses.

Major Northeast Asian economies are working toward this end, and beginning this work at home. China, Japan, and the Republic of Korea (hereafter Korea) collectively account for 30 percent of global emissions, and each country recognizes that putting a price on these emissions is a vital way to change behavior. China is transitioning from pilot experimentation to a national emissions trading system (ETS) that will immediately become the largest in the world. Japan continues to operate subnational and voluntary markets at home, and to use markets to invest in emissions reduction abroad. Korea's national ETS is entering its second phase and will evolve to become the core instrument of Korea's climate mitigation agenda.

These systems now operate in separate tracks, and would better serve one another and global climate change mitigation by steadily converging. While China, Japan, and Korea are understandably fixated on domestic progress, their early phases need to yield markets that are flexible and "linkage ready" if the benefits of market connectivity are to take shape. Such connectivity has high-potential upsides, and there are promising signs of regional interest. Government ministries in each country are now officially supporting technical and scholarly collaboration on regional carbon market linkage, and linkage-related items are steadily climbing the ladder of bilateral and regional diplomatic agendas.

We at the Asia Society Policy Institute (ASPI) are part of these efforts and are working to accelerate and deepen progress through our initiative, "Toward a Northeast Asia Carbon Market." Since 2015, this initiative has regularly brought together experts and practitioners to develop and assess regional pathways to market linkage. We offer this report to present our latest key findings, and to contribute ideas on how to advance toward market linkage during the 2018–2020 period.

The report first locates Northeast Asia's regional markets within their domestic policy landscapes and analyzes why each country is operating carbon markets and what it hopes to accomplish from them. The three countries are building systems that reflect their unique environmental, economic, and political characteristics.

China's ETS is based on efficiency targets and seeks to not only address climate change but also to help pull the country into a greener growth future. Japan pursues multiple mandatory and voluntary carbon market approaches at subnational and international levels, which exist alongside continuing energy-mix questions in the wake of the 2011 Fukushima nuclear disaster. Korea seeks to use its nascent national scheme with future international market connections as the key pillar of its climate policy, which will require improving both its function and its governance.

The report argues that cooperation among these disparate systems is possible, and politically attractive, if it embraces their differences and potential complementarities. Through such an embrace, the countries can lower the cost of reducing their emissions and pave the way toward more ambitious climate change policies.

Advancing cooperation among these markets will require clear strategies. This report offers seven for the 2018–2020 period. It argues for greater regional transparency and cooperation on monitoring, reporting, and verifying emissions reductions, both to build confidence and as a practical matter. It calls for moving carbon market cooperation up the agenda of the China-Japan-Korea Trilateral Summit as a means for galvanizing critical political discussions. The report details how to build the regional market linkage evidence base in Northeast Asia through targeted, cutting-edge research cooperation—some of which ASPI is currently developing, and calls for greater regional collaboration on the major international carbon market mechanism, Article 6 of the Paris Agreement, as its rules are being constructed in years to come. The report proposes real-time market linkage simulations on regional trading platforms, an expansion of current ASPI simulation work with its partners at the Environmental Defense Fund. It argues for the promise of piloting subnational market linkages across the region and offers pathways for doing so. And the report contends that China, Japan, and Korea should agree on a prospective date at which to begin official diplomatic discussions on selectively linking their carbon markets—a temporal goal that will help shape the foundation for cooperation while linkage is being built.

Many people and organizations have helped us develop the analysis found here. Particular thanks are owed to our partners at the World Bank Carbon Pricing Leadership Coalition, which through the leadership of Angela Churie Kallhauge and her colleagues has co-convened dialogues alongside us and helped us deepen our thinking and extend our impact. Special thanks also go to Nicolette Bartlett, Paula DiPerna, and their colleagues at CDP for partnering with us on a roundtable during New York climate week, and to Dirk Forrister, Lisa Spafford, and their colleagues at the International Emissions Trading Association for providing platforms and partnership throughout 2017 for this initiative. Regional representatives and thought leaders have also made critical contributions, including Suh-Yong Chung, Sungwoo Kim, Zhuli Hess, Takashi Hongo, Duan Maosheng, Andrei Marcu, Yuji Mizuno, and Wu Qian. While this report would not be possible without their insights, the authors take full responsibility for its content. Thanks are of course due to the authors and daily stewards of this work, ASPI's Dr. Jackson Ewing and Minnie Shin. And, I also wish to thank the MacArthur Foundation and the Japan Foundation for their partnership and support—without which we could not have engaged in this body of work.

This report is not the beginning of the end of this initiative, but the end of the beginning. ASPI will expand its work in Northeast Asia to help build carbon market cooperation and offer tangible and pragmatic policy ideas toward those in a position to drive this cooperation forward.

As President of the Asia Society Policy Institute, I am confident that carbon market cooperation and future linkage in Northeast Asia would greatly enhance our global efforts to meet the climate challenge. I hope that this report offers timely contributions toward this goal.

The Honorable Kevin Rudd
President, Asia Society Policy Institute
26th Prime Minister of Australia

EXECUTIVE SUMMARY

NORTHEAST ASIA IS EMERGING AS THE EPICENTER OF GLOBAL CARBON MARKET ACTIVITY. The region's nascent carbon markets have unrivalled potential along with a range of challenges to overcome. The domestic effectiveness and regional connectivity of these markets will define the next generation of emissions trading, and significantly impact future international climate change mitigation policies and resource flows.

Considerable emissions trading system (ETS) expansion in Northeast Asia is creating questions about the future of regional market integration. While China, Japan, and the Republic of Korea (hereafter Korea) are understandably fixated on domestic progress, formative phases need to yield markets that are flexible and "linkage ready" if the benefits of market connectivity are to take shape. This report explores the key characteristics of each of these markets and locates them within the wider policy contexts of each country. It then offers analysis on promising pathways for regional market cooperation during the 2018–2020 period.

China's prioritization of carbon market policies has the potential to remake the sector regionally and globally, and substantially impact global climate response efforts. Its pilot and soon-to-be-launched national ETSs are policy instruments not just for lowering emissions but also for aiding the country's transition to cleaner, more balanced growth. China must continue to build its operational capacities, particularly on monitoring, reporting, and verification (MRV), and manage the difficult transition from pilots to a national scheme. Prospective linkage partners will need to reconcile themselves to China's emissions intensity-based targets and find symbiotic avenues for cooperation.

Japan will need to scale-up its regional and international carbon market engagement to meet its current and future climate change goals. The 2011 earthquake, tsunami, and Fukushima nuclear crisis continue to loom large over Japan's energy and environmental policy-making arenas. As the country struggles to replace former nuclear capacity with low-emissions alternatives, market mechanisms that facilitate emissions reductions through international partnerships grow in importance. Without a national ETS, Japan faces parity issues when considering regional linkage that need to be overcome by creative approaches.

Korea has codified international carbon market cooperation as a core strategy for meeting its emissions reduction targets. Its current market—while making impressive strides—will fall short of making critical contributions to the country's climate goals unless it scales-up cooperation outside its borders. To make such cooperation a reality, Korea must maintain more governance and regulatory stability at home.

The report elaborates on each of these national contexts in Sections 2, 3, and 4. Section 5 offers practical pathways for deepening regional carbon market cooperation in Northeast Asia. Section 6 concludes the report by arguing that rather than precluding linkage, the differences among the three countries and their markets offer synergies to be taken advantage of through market connections.

CHINA PRIORITIZES ITS CARBON MARKET POLICIES

China's economic growth has increased its strategic influence and brought hundreds of millions of its citizens out of poverty. It has also brought with it wealth gaps, economic bloat, graft and inefficiency, and pronounced pollution. China now searches for continued economic vitality while reversing this emissions trajectory and is using carbon markets as key tools for doing so.

China is moving from a period of pilot carbon market experimentation to a national ETS. These pilot schemes were formed to reflect the varied economic, environmental, and sociopolitical conditions that define China. They encapsulate the political and business hubs of Beijing and Shanghai, the sprawling industrial municipalities of Tianjin and Chongqing, the manufacturing locus of Guangdong province, the iron and steel center of Hubei province, and the Hong Kong–affixed special economic zone of Shenzhen. They have yielded unique lessons on issues of allowance allocation, openness to innovative financial products, coverage, compliance obligations, and penalties among others. These lessons provide the foundation for China's national ETS.

The national market will come online—likely in early 2018—in a complicated and often overlapping environmental policy space marked by existing and proposed trading and subsidy policies for energy efficiency, air pollution, and renewable energy. These policy tools have complex effects on the supply and demand of carbon credits, and they may interact with the ETS in both reinforcing and countervailing ways. There are also questions about interministerial and provincial-to-central-government coordination, with the ETS under National Development and Reform Commission (NDRC) leadership but with rules spread across the jurisdictions of multiple government agencies. Poor collaboration between these players could foment operational problems for the ETS as it moves to the national level.

China's national ETS will impact international carbon trading and climate mitigation efforts in yet untold ways. The scale of its market and presence of covered industries in international supply chains means that it will influence trade, competitiveness, and carbon prices in other markets around the world. Market cooperation and selective links could create revenue-generation possibilities for China as it sells credits to neighbors that face higher abatement costs and could yield geopolitical dividends as a form of regional and international climate change leadership. These efforts hinge on their capacity to forge symbiotic relationships that contribute to disparate national interests in Northeast Asia and beyond.

JAPAN'S NEED FOR CARBON MARKET CONNECTIONS

Japan's response to the 2011 Fukushima nuclear crisis is fundamentally altering its approach to energy security, climate mitigation, and by extension the role that carbon pricing plays and is likely to play in the country. Nuclear power was poised to become Japan's keystone energy source, contributing roughly 60 percent of primary energy in 2100. With nuclear growth plans shelved due to public opposition, Japan must look elsewhere for low-carbon growth outcomes. It is already very energy efficient and is struggling to bring renewable energy online at rates that can replace growing fossil-fuel consumption. These factors make international carbon market cooperation particularly appealing as an emissions-reduction tool.

Despite having no mandatory national ETS, Japan has an existing carbon market portfolio from which to extend. It has experimented with ETSs for most of the past two decades and continues to operate a voluntary scheme (J-Credit) that helps facilitate emissions reductions in participating firms. The Tokyo

Metropolitan Government (TMG) launched an ETS in 2010 covering large offices and factories, which has subsequently increased its emissions-reduction requirements and linked with a second ETS in Saitama Prefecture. These mandatory schemes have operated largely as designed, but relatively low levels of ambition call into question their overall emissions impact.

Japan was an early adopter of international strategies to offset its emissions through investment and project development. The Joint Crediting Mechanism (JCM) allows Japanese firms to invest in emissions-reducing projects and programs in developing countries. The recipient country accounts for part of the resulting emissions reduction, and part accrues to Japan as offset credits. The Japanese government is scaling-up the role that these JCM credits will play in its climate mitigation strategy.

Market connections in Northeast Asia are a potentially high-value conduit through which Japan can pursue its future climate mitigation strategies, and links with Korea and particularly with China offer pathways for Japan to access lower-cost emissions-reduction options than those it enjoys domestically.

KOREA MOVES FIRST ON A NATIONAL ETS

Korea's rapid economic growth during the latter half of the twentieth century wrought significant environmental impacts, which it now seeks to redress through an official Low Carbon Green Growth (LCGG) strategy. The Korean ETS (KETS) is a core pillar of this transition and became the first national system in Northeast Asia when it launched in 2015. It is currently transitioning from the first to the second phase of a three-phase process, and as it matures it will seek international engagement to increase its emissions-reduction options.

The KETS is designed to be adaptable and uses banking, borrowing, and offset mechanisms to ensure flexibility. KETS performance has been mixed. Prices have proven volatile, liquidity and trading have been low, and regulatory uncertainty has abounded. Korean firms have expressed reluctance to actively participate in the market due to frequent interventions by the government, and difficulties in making market projections. The transferring of ETS authority from the Ministry of Environment (MOE) to the Ministry of Strategy and Finance (MOSF) and then most recently back to the MOE is emblematic of continuing governance fluctuations.

In part because of these limitations, Korea is not currently on track to meet its climate goals, and the KETS is not currently providing the large-scale emissions-reduction options that the country seeks. As Korea is typically a net purchaser in linked scenarios, carbon market connections could increase its abatement options significantly. It could also rekindle Korea's flagging reputation as a global climate change leader.

PATHWAYS TO NEAR-TERM CARBON MARKET COOPERATION IN NORTHEAST ASIA

The 2018–2020 period will shape the longer-term landscape of carbon pricing in Northeast Asia. Korea and China will progressively deepen their domestic ETSs and seek to optimize their functionality through experimentation and capacity building. Japan will review its domestic and international pricing efforts and likely be influenced by the progress in neighboring countries. These countries can pursue the following actions now to build a foundation for more extensive carbon market cooperation in the future:

1. Cultivate transparency around MRV rules and practices. Regional MRV systems need to be partially harmonized and clearly spelled out so that each jurisdiction can develop confidence that the credits being allocated by linked partners have a sound economic and environmental basis. It will take time to foster this MRV confidence on multilateral levels, and lines of communication and openness are vital.

2. Move carbon market cooperation up the agenda of the China-Japan-Korea Trilateral Summit. The annual trilateral summits offer opportunities for high-level political dialogue on carbon market cooperation, champions of which should work with partners at relevant ministries and beyond to encourage a focus on carbon pricing at future summits.

3. Build the regional linkage evidence base. Regional scholarly collaboration is needed to develop and deploy quantitative models that offer pragmatic economic and environmental assessments of linkage impacts, and to evaluate legal and political processes from which linkage can extend. These include analysis on marginal abatement cost reductions, mitigation values, and cross-boundary revenue flows in linked regional markets. Findings must then be presented to policy-making communities in ways that can help inform their decision making.

4. Encourage regional collaboration to influence the implementation of Article 6 of the Paris Agreement. Articles 6.2 and 6.4 of the Paris Agreement will be further defined during the 2017–2019 period, and Northeast Asian countries could have greater impact on their implementation through finding common negotiating positions and pursuing them at international climate change forums.

5. Facilitate real-time market linkage simulations on trading platforms. The development of ETSs outside of Asia has benefited from simulated trading exercises on actual exchanges using hypothetical emissions credits. Similar progress could be made on Northeast Asia market linkage through such experimentation, which can be facilitated with no material risk.

6. Pilot linked subnational markets across Northeast Asia. Piloting subnational connections in the region across a limited number of sectors for an initial test period would lower barriers for entry into regional market links and provide a test-bed for regional carbon market connectivity. Regional cities, capital regions, provinces, and prefectures should enter discussions to elaborate and pilot subnational linkages.

7. Agree upon a prospective date at which to begin official discussion on the launch of select market linkages. It is essential to have a temporal goal for the beginning of official policy dialogue on regional market linkage while the foundation for these negotiations is being built. Government leaders should come to aspirational agreement, without binding commitment, on when to begin official talks.

CONCLUSION

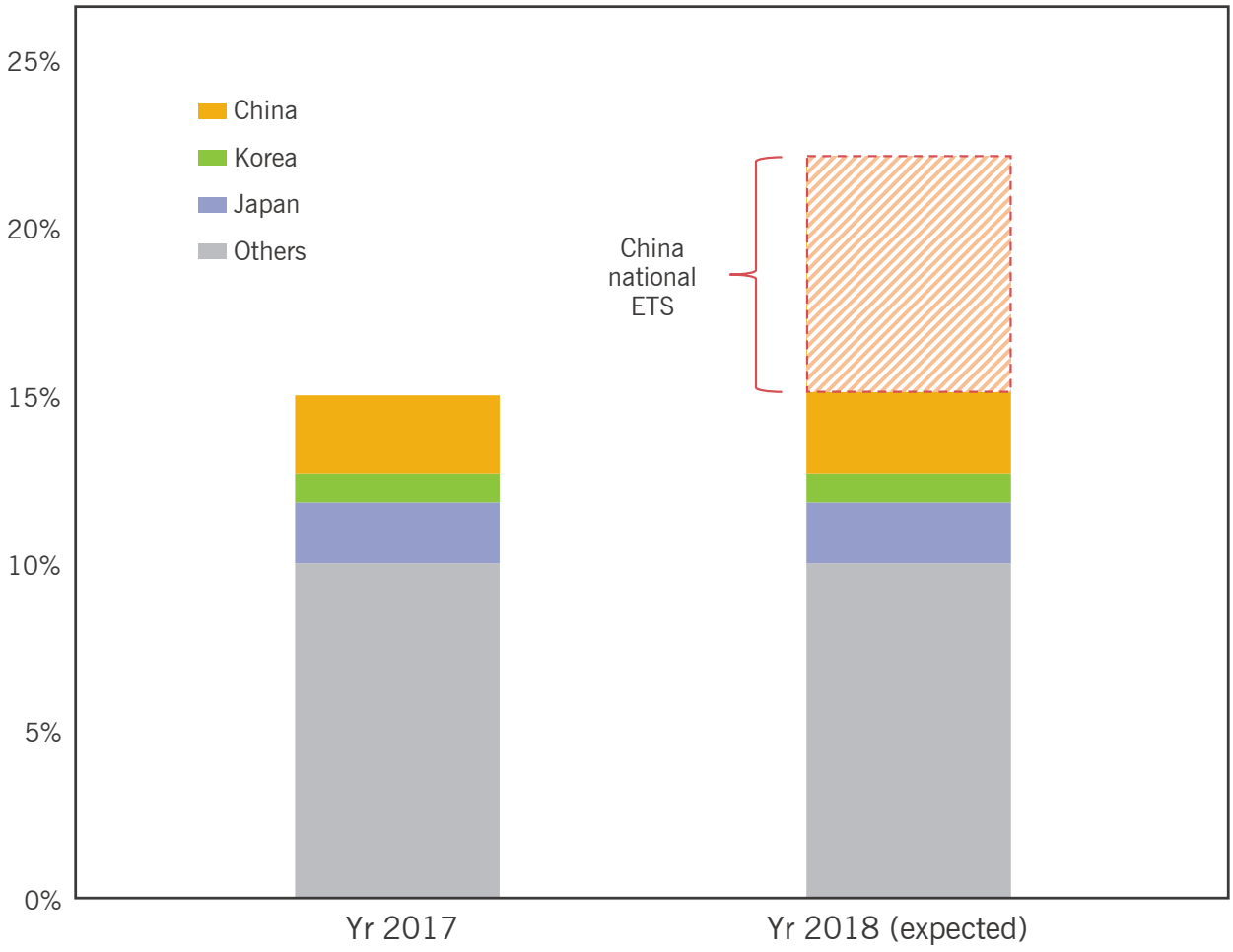
Evidence from past linkage efforts demonstrates that while geographic proximity and close economic ties play a crucial role in building a relationship toward linkage, these factors do not guarantee successful market integration. Integrating carbon markets requires a series of preliminary steps and pilot initiatives to be successful. Because Northeast Asia is in the formative phase of carbon market construction, the countries have an opportunity to synergize some design elements in the near term and begin working through economic and geopolitical challenges that accompany market cooperation.

The key at this juncture is to create linkage-ready markets and a clear work plan for pursuing cooperation. Regional carbon markets will not become homogenous, share all design characteristics, or have a completely unified emissions cap or carbon price in the foreseeable future—or perhaps ever. The natural endowments, economic and political systems, and related climate change policies of these countries will continue to vary widely. These differences do not mean that their carbon markets cannot or should not be linked. Targeted, mutually beneficial links require harmonizing some aspects of domestic markets and designing the avenues of commonality needed to enable trading emissions allowances across different jurisdictions.

1. INTRODUCTION

THE EPICENTER OF GLOBAL CARBON PRICING IS MOVING EAST. After decades of fits and starts and European first-movers, the most impactful carbon market developments are now occurring in Northeast Asia (see Figure 1). The region's fledgling markets have unrivalled potential along with steep operational hurdles to overcome. Their domestic effectiveness and regional connectivity will define the next generation of emissions trading and help shape future international climate change mitigation policies and resource flows.

FIGURE 1. PERCENTAGE OF GLOBAL TOTAL EMISSIONS COVERED THAT COMES FROM NORTHEAST ASIA



Source: Data from the World Bank, "Carbon Pricing Dashboard," accessed November 14, 2017, http://carbonpricingdashboard.worldbank.org/.

Note: Japan includes Tokyo CaT, Saitama ETS, Japan carbon tax; China includes regional pilot and national ETS.

Taken together, the considerable emissions trading system (ETS) expansion in Northeast Asia begs questions about the future of regional market integration. While China, Japan, and the Republic of Korea (hereafter Korea) are understandably fixated on domestic progress, formative phases need to yield markets that are flexible and "linkage ready" if the benefits of market connectivity are to take shape. Such connectivity has high-potential upsides, and there are promising signs of regional interest.[1]

Through its scale, Northeast Asia can craft the most significant carbon-pricing regimes in the world: China, the world's top greenhouse gas (GHG) emitter, has pledged to peak its carbon emissions by 2030 and will roll out the world's largest ETS in early 2018. Japan has been actively engaged in carbon pricing through its voluntary and subnational carbon markets and international crediting mechanism and is currently assessing the potential for introducing a nationwide mandatory carbon market. Korea currently operates the second-largest national ETS globally and is expected to strengthen its climate policies under President Moon Jae-In's leadership. Northeast Asia accounts for approximately 30 percent of the global emissions profile, and 23 percent of the nominal gross domestic product (GDP).[2] Finding avenues for cooperation and targeted links between regional carbon markets would substantially influence global climate mitigation efforts and help spearhead regional transitions to low-carbon growth.

While China, Japan, and Korea are understandably fixated on domestic progress, formative phases need to yield markets that are flexible and "linkage ready" if the benefits of market connectivity are to take shape.

This report follows from the Asia Society Policy Institute's (ASPI) 2016 *Roadmap to a Northeast Asian Carbon Market*, which built a case for regional carbon market links and analyzed different processes and designs that China, Japan, and Korea could pursue to that end.[3] This report focuses on the foundations and trajectories of carbon markets in the three countries and provides a richer discussion of the forces underpinning them. The impetuses for developing carbon markets in Northeast Asia inform their designs and the roles they play—and will play—in the climate change, energy, and economic development strategies of China, Japan, and Korea. The report locates these markets in the policy landscapes of each country; traces their origins, designs, and trajectories; and from this analysis determines promising avenues for cooperation. These cases vary widely, and the four sections that follow emphasize different dynamics and variables as a result.

Section 2 argues that China's prioritization of carbon market approaches has the potential to remake the sector regionally and globally, and to make substantial contributions to addressing the climate crisis. China's pilot and soon-to-be-launched national ETSs are policy instruments not just for lowering emissions but also for aiding the country's transition to cleaner, more balanced growth. China's approach to ETS development—and its context within a range of other policy instruments—reflects these goals and creates challenges and opportunities domestically and regionally. For its part, China must continue to build its operational capacities, particularly on monitoring, reporting, and verification (MRV), and manage the difficult transition from pilots to a national scheme. Prospective linkage partners will need to reconcile themselves to China's emissions intensity-based targets and find symbiotic avenues for cooperation.

Section 3 suggests that Japan will need to scale-up its regional and international carbon market engagement to meet its current and future climate change goals. The 2011 earthquake, tsunami, and

Fukushima nuclear crises continue to loom large over Japan's energy and environmental policy-making arenas. As the country struggles to replace former nuclear capacity with low-emissions alternatives, market mechanisms that facilitate emissions reductions through international partnerships grow in importance. This section focuses on the discontinuity between Japan's climate change goals and its energy trajectory, concluding with how its carbon market policies could grow to address this challenge.

Section 4 makes the case that Korea's carbon market development—while laudable—will fall short of making critical contributions to the country's climate goals unless it scales-up cooperation outside its borders. To an extent, Korea already accepts this and has codified international carbon market cooperation as a core element of its climate change goals. The essential near-term task is making this cooperation a reality.

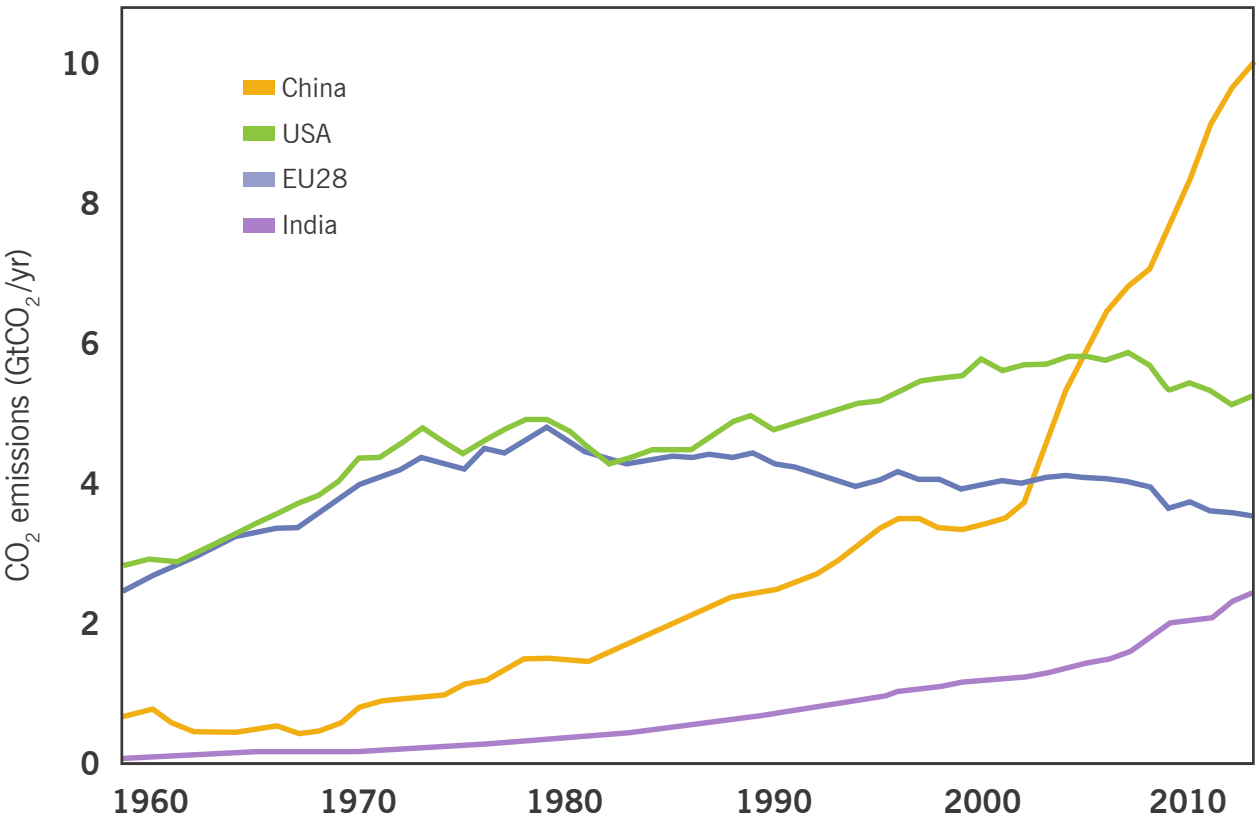
Sections 5 and 6 synthesize the report's arguments and contend that rather than precluding linkage, the differences among the three countries and their markets present synergies to be taken advantage of through market connections. It does not rehash the case for carbon market linkage in Northeast Asia previously presented in the 2016 *Roadmap to a Northeast Asian Carbon Market*. Rather, the report concludes with practical pathways for deepening regional carbon market cooperation in Northeast Asia during the 2018–2020 period.

2. CHINA PRIORITIZES ITS CARBON MARKET POLICIES

CHINA IS SEEKING THE GREATEST decoupling of economic and emissions growth ever attempted. While the country's gross domestic product (GDP) has grown more than 500 percent since 1980, its emissions went from globally marginal to dwarfing those of its nearest competitors (see Figure 2). Its growth has increased its strategic influence and brought hundreds of millions of its citizens out of poverty. It has also brought with it wealth gaps, economic bloat, graft and inefficiency, and pronounced pollution. China now searches for continued economic vitality while reversing this emissions trajectory. Its degree of success is, for now, the most important climate mitigation factor in the world.

China seeks future development alongside cleaner environments, narrower income disparities, and a greater emphasis on high-value segments of the global economy. It is launching a national emissions trading system (ETS) not just to address climate change but also as a tool to help usher in this new era.

FIGURE 2. CHINA TAKES THE GLOBAL EMISSIONS LEAD



Source: Adapted from the Global Carbon Project. "Global Carbon Budget 2014," September 21, 2014, www.globalcarbonproject.org/carbonbudget/archive/2014/GCP_budget_2014_lowres_v1.02.pdf.

2.1 LOCATING CARBON MARKETS IN CHINA'S POLICY LANDSCAPE

China's national ETS launch will be the most important global carbon market development since the creation of the Kyoto Protocol in 1997. It will also be the latest, and possibly most materially significant, piece of climate policy to support claims that Beijing is becoming a global climate change leader. While it orients around greenhouse gas mitigation, China's ETS is also important in the minds of Chinese leadership as a way to curtail crippling air pollution, encourage growth in emergent sectors, and transfer wealth to peripheral provinces.

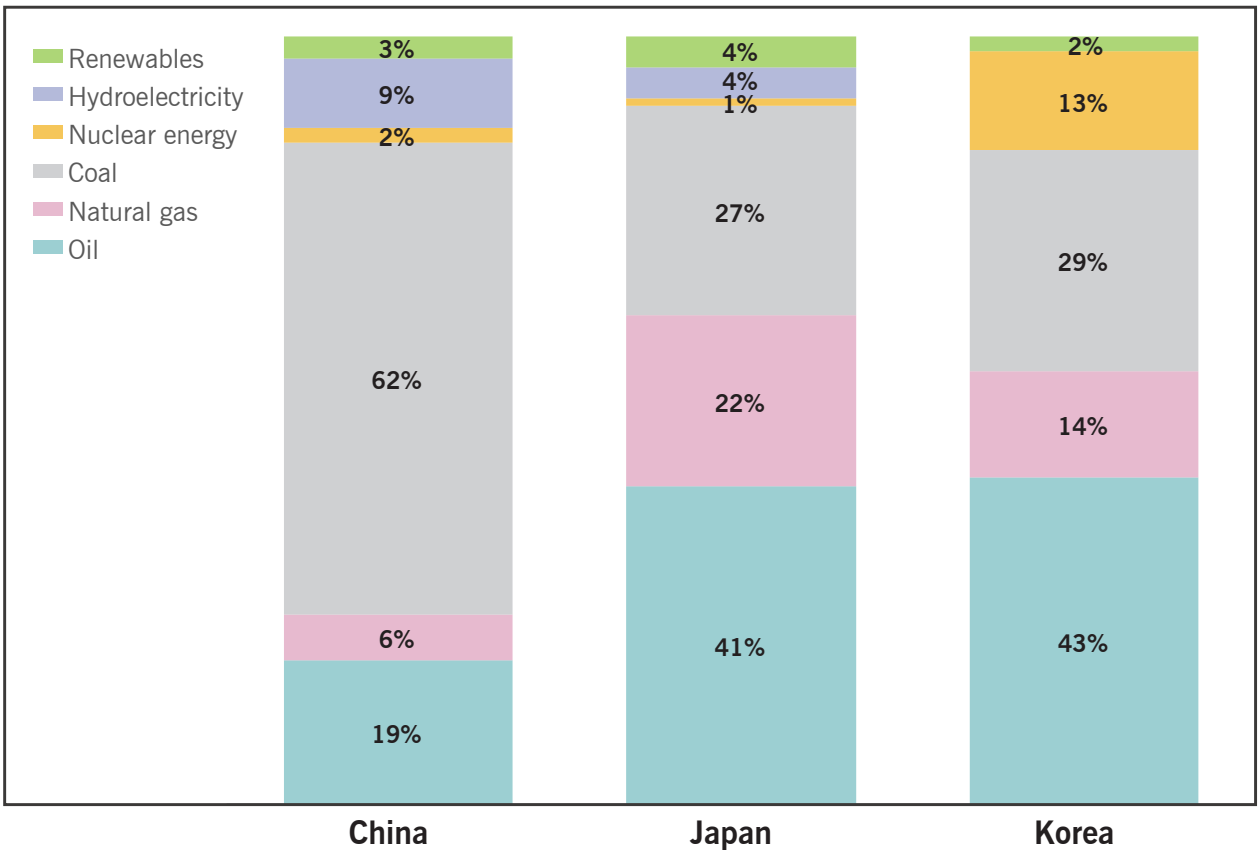
Outcries against air pollution and environmental stress—which may contribute to more than 1.6 million deaths per year—has made transforming energy systems a key part of Beijing's strategic planning.[4] Its energy and environmental ambition are prodigious. Estimates suggest that the country will require USD 2.8 trillion of spending for 2,547 gigawatts of new power by 2040.[5] Wind and solar capacity is set to increase eightfold to help meet this demand, while helping to steadily extract China from polluting fuel sources. These efforts dovetail with China's desire to transition away from an economy based on heavy industry and material exports to one steeped in higher-value tech and service sectors.[6] Figure 3 shows the energy mix that China is seeking to move on from, compared to the more diversified portfolios of its Northeast Asian neighbors. Emissions trading may become the leading public policy instrument for ushering in this new era.

China's broad intentions for the national ETS could be transformative, or it could impede its effectiveness as a mitigation tool. The ETS may follow the Deng Xiaoping maxim that "it does not matter whether a cat is white or black, as long as it catches mice" and lead to robust climate change mitigation alongside the co-benefits Chinese leaders seek. It may rather happen that the multiple drivers of the ETS and overlapping policies alongside it impede its effectiveness.

China's ETS will come online in a complicated and often overlapping environmental policy space marked by existing and proposed trading and subsidy policies for energy efficiency, air pollution, and renewable energy. These policy tools, which include a newly launched tradable green certificate scheme to support clean energy, expand the risk of double counting and create complex interactions with the supply and demand of carbon credits. European Union (EU) experiences have shown how subsidizing renewable energy can decrease demand for carbon credits and erode the value of an ETS, and recent modeling of these interactions in China suggest similar challenges.[7]

There are also myriad questions about interministerial and provincial-to-central-government coordination. While the ETS is under National Development and Reform Commission (NDRC) leadership, its rules spread across the jurisdictions of multiple government agencies. The NDRC is a powerful cabinet player in the State Council and dominates China's climate policy process. It has championed the ETS and protected its regulatory control over it, outmaneuvering competing policy proposals by the Ministry of Finance (MOF) for a carbon tax in the process. But some form of carbon tax system may yet emerge, to say nothing of the policies relating to emissions emerging from provincial governments and the Ministries of Environmental Protection (MEP), Agriculture (MOA), and Commerce (MOC) among others. Poor collaboration between these players could foment a range of operational problems for the ETS as it moves to the national level.

FIGURE 3. 2016 PRIMARY ENERGY CONSUMPTION BY FUEL IN NORTHEAST ASIA



Source: BP, "BP Statistical Review of World Energy of 2017," 66th Edition, June 2017, www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of-world-energy-2017-full-report.pdf.

These contextual considerations are amplified by the need to rapidly grow the capacities of China's ETS operators. Prior to launching its pilot ETSs, China had scant GHG accounting capacity and much of the country's expertise and experience remain concentrated in the pilot regions. China has made rapid progress, and still the effectiveness of the national system will require long-term commitments to capacity building both domestically and in cooperation with international partners. Since 2013, China's pilot ETSs have served both as laboratories for policy designs and forums for building these essential capacities.

2.2 THE PILOTS

Chinese ETSs result from more than a decade-long transition from top-down command and control strategies for environmental management to measures that are more flexible and iterative. This shift was signaled at the sixth National Environmental Protection Conference in 2006, but China continued its traditional reliance on regulatory and administrative environmental measures for much of the remaining 2000s. It deployed these measures toward its primary goal at the time: reducing its energy intensity by

20 percent by 2010 and used heavy-handed approaches such as shutting down factories and restricting electricity use in the latter half of 2010 to this end.[8] This yielded a hollow victory. China hit its efficiency target but faced costly and unsustainable administrative burdens to do so.[9] The country's leaders recognized that reaching their larger climate, environmental, and energy transition goals would require new approaches.

In 2010, China embarked on low-carbon development strategies in provinces and cities, which progressively grew in number and scale and proved a precursor to the NDRC approving seven pilot carbon-trading schemes in October 2011.[10] These pilot schemes are intentionally diverse, spanning north, midwestern, and southern coastal regions. They encapsulate the political and business hubs of Beijing and Shanghai, the sprawling industrial municipalities of Tianjin and Chongqing, the manufacturing locus of Guangdong province, the iron and steel center of Hubei province, and the Hong Kong-affixed special economic zone of Shenzhen.[11] These pilots are emblematic of the varied economic, environmental, and sociopolitical conditions that define China. They are also large in scale, representing 19 percent of the total population, 27 percent of GDP, and 24 percent of total national energy consumption.[12] The total allowances for the seven trading programs added up to 1.2 billion tons of carbon dioxide per year, about 11.4 percent of national emissions in 2014.[13]

These pilots are emblematic of the varied economic, environmental, and sociopolitical conditions that define China. They are also large in scale.

By mid-2014, each of the seven pilots was trading, and their approaches—like their respective contexts—varied widely while sharing some core characteristics. Both the commonalities and differences are informative. Each pilot had to build substantial measurement, reporting, and verification (MRV) capacity, the burden for which increased with the GHGs they covered. As a result, six of the seven pilots covered just CO_2, with only Chongqing electing to cover all six GHGs included under the Kyoto Protocol. Likewise in the MRV vein, each pilot developed third-party verification procedures for the emissions reports submitted by covered entities.

Commonalities also existed in coverage and allocation designs. The Chinese pilots differed from the EU ETS and many other international systems by covering enterprises rather than facilities and buildings. The pilots similarly went in a different direction from most of their predecessors in how they covered indirect emissions: they included indirect emissions from electricity generation within the pilot region and emissions from electricity imported from outside the pilot areas. This stops short of recognizing all the embedded emissions of products consumed or finished in the pilot regions, but it does seek to account for their electricity carbon footprint.[14] By doing so, the pilots removed incentives for pilot regions to simply import more electricity from uncovered external sources to lower their footprints.

Allowance determinations and characteristics likewise had some continuity in the pilot ETSs. Each system contained the same five types of allowances: (1) for initial distribution, (2) for adjustments, (3) for new entrants, (4) for auctioning, and (5) for price stabilization reserves.[15] Each system has processes in place to recognize early abatement actions and avoid unduly penalizing the fast successes of efficient companies; each used combinations of benchmarking and grandfathering to distinguish between existing and new entrants into the market. Each pilot allowed covered entities to apply for allowance adjustments in special circumstances. And while they take different forms, each pilot employs price stabilization

mechanisms that facilitate government intervention to address supply-demand imbalances. In practice, these mechanisms provide allowance pools from which governments can buy back allowances in cases of acute oversupply, creating ostensible price floors in the process. Participants also have access to flexibility mechanisms through being able to use China Certified Emissions Reduction (CCER) credits—which are offsets approved through a Chinese measurement, reporting, and verification (MRV) process—for part of their compliance requirements.

The most fundamental commonality among the pilots, and a characteristic that they will share with the new national system, is their basis in efficiency standards rather than hard caps. China's ETSs are forms of a tradable performance standard (TPS), under which government administrators determine maximum emission intensity relative to output. Covered firms with emission rates below the standard earn tradable credits, while those that exceed the standard must acquire and submit allowances to cover the excess.[16] In other words, Chinese entities are judged not for their absolute emissions, but for their emissions performance in reaching ever-changing outputs. The TPS approach has the advantage of adapting to economic changes —that is, changes in output—but also adds extra layers of complexity for China's pilots and national ETS ambitions.[17]

Taken together, these common pilot characteristics provide coherent touch points for China's broad approach to domestic emissions trading. They also ensure that actors within each system are concurrently developing some of the core competencies essential for building the national system. But architects of the pilots still had room to build and operate systems in ways that they concluded would address their unique local conditions and would maximize their individual performance.

The most fundamental commonality among the pilots, and a characteristic that they will share with the new national system, is their basis in efficiency standards rather than hard caps.

The most fundamental of these different designs concerned coverage: pilots covered from 4 (Guangdong) to 26 sectors (Shenzhen) and placed different emissions thresholds on what entities would be included.[18] As a result, the number of entities covered (114 in Tianjin, 635 in Shenzhen) and the percentage of total emissions covered (36 percent in Hubei, 57 percent in Shanghai) varied widely. Within these variable coverages, the pilots also took multiple approaches to allowance allocation. All pilots allocated a majority or all of their allowances for free, but they took different paths getting there. Shanghai provided all allowances for the 2013–2015 phase at once, while the other pilots dispersed them year-by-year. Some sectors grandfathered allocations based on historical emissions, and others on historical emissions intensity. Pilots using grandfathering took different approaches to recognizing and rewarding early abatement actions, and the pilots pursued varying approaches to adjusting allowances to respond to market conditions.

The pilots also took varying approaches to limiting the market power of singular large actors (which is an issue in all ETSs), with Beijing limiting the percentage single entities could bid for in an auction (15 percent of the total), and Shanghai requiring negotiated transactions for transfers of 100,000 or more metric tons.[19] Conditions whereby governments could enter the markets on cost-containment grounds varied, as did requirements on the origins and characteristics of the CCERs that could be used. Some pilots

offer auctions toward the end of compliance periods to give entities a final chance to meet their obligations, and Shanghai and Shenzhen offer additional allowances for auction of the final trading day.[20] Others made no such provision.

Each pilot enforced compliance but did so through a variety of reputational and punitive ways. Some publicized the noncompliance of entities through credit records; others deterred noncompliers from applying for public energy saving funds or blocked access to public finances in low-carbon development or renewable energy for a period of time.[21] Some pilots were more corrective, deducting shortfalls in allowances from the allocation amount an entity would receive the following year, or—in the case of Guangdong and Hubei—deducting twice that amount. Beijing put fines for noncompliance in place at three to five times the average market price over the six months prior to the shortfall.[22] Compliance governance and regulation also varied among pilots, with only Beijing and Shenzhen codifying rules through local legislation. While all pilots issued local MRV guidelines, these contained different transparency measures and legal effects and reflected the variable coverage and operational characteristics described above. Appendix A captures the similarities and differences among China's ETS pilots in detail.

Like their designs, the performance of the pilots has been mixed. By October 2016, the pilots had traded roughly 94 million tons of emission allowances at an average price of USD 3.72/ton.[23] This amounted to less than 10 percent of total allowances in the markets, revealing a lack of liquidity. Compliance rates across the markets were strong. Beijing, Guangdong, Hubei, and Shanghai achieved complete compliance in 2015, with Shenzhen and Tianjin close behind.[24] This rate is largely due to abundant allowance allocations and local government efforts to help firms meet their commitments through capacity assistance, extending deadlines, and holding extra allowance auctions before the end of compliance periods. Only Chongqing reported comparatively low compliance rates of just over 70 percent.

The pilots' varied operational characteristics reflect both their designs and their economic contexts. Shenzhen was the most active market with the largest number of participants and highest maximum price. Hubei had the largest trading volume, and Beijing had an active market, the earliest yearly peak, and second-highest price. Shanghai achieved the strongest compliance record. Guangdong had the largest size of emissions allowances, while Tianjin covered the fewest firms, and Chongqing had the least activity. These outcomes stem from a range of direct and indirect features, with embedded lessons.

Shenzhen's active nature stemmed from its participant size, its openness to institutional and foreign investment, and its embrace of innovative financial products such as carbon bonds and carbon forward contracts. Hubei's high trading volume corresponded with its disavowal of banking between compliance periods, which likely spurred greater demand. Beijing's market was active in part as a result of proximity to financial institutions, fund management firms, and the central government, and its early peak reflects an early compliance deadline that spurred action among covered entities. Shanghai's strong compliance record resulted at least partly from its role as China's financial center and the access to institutional and human resources that it provides. Guangdong reconciled its large size with being the only pilot that pursued auctions of emissions allowances as part of price discovery. Tianjin's thin trade likely resulted from a small number of firms accounting for a large percentage of emissions, and its relatively lenient penalties for noncompliance. Chongqing's inactivity was due to abundant allowance allocation for covered firms, most of which it viewed as foundational for its economy.[25]

As the pilots began trading in 2013 and 2014, China's Central Committee was making key decisions on the country's 13th Five Year Plan (2016–2020), and market-based instruments for environmental management were ascendant. NDRC plans were taking shape to leverage the pilot experiences to create a national market, which the intervening years have seen change in design and in scope.

2.3 THE ROAD TO A NATIONAL ETS

China's national ETS is designed to ultimately cover the highest emitters in the most emissions-intensive sectors across the country. Since 2015, the NDRC has worked to determine the scope of industry coverage, construct a national MRV system, coordinate provincial reporting on the carbon inventories of thousands of individual entities, and feed this information into a coherent national quota allocation plan. At the Paris climate summit (COP21) in December 2015, leading NDRC official Jiang Zhaoli described a scheme that would cover some 10,000 emitters across six sectors and fifteen sub-sectors, regulating more than 4 billion tons of CO_2 annually.[26]

China's national ETS is designed to ultimately cover the highest emitters in the most emissions-intensive sectors across the country.

Given this workload, it is unsurprising that the ambition for the start of a national ETS steadily tempered in advance of the launch. Initially pushed from 2016, only months prior to its planned late-2017 launch, basic questions remained on when the scheme would start, what the rules would be, where it would be housed, and who would participate. Issues of precise coverage, allowance allocation, and compliance obligations continue to plague regulators at the time of this writing. Initial ETS coverage was first pared down to power generation, aluminum, cement, and aviation—which alone would constitute a cap of 4 to 5 billion tons of CO_2 (roughly 1.5 times the size of the EU ETS).[27] Ultimately this reduction may prove insufficient, with China now likely opting for a power sector–only ETS in response to lingering uncertainties and industry concerns on allocation methodologies and overall ETS operations.[28] This outcome breeds difficulties for an ETS designed to see trade across different industries facing different mitigation costs.

In November 2017, leading climate official Xie Zhenhua announced at the climate summit in Bonn (COP23) that the national market would not be launched there as anticipated, and that it still required approval by the State Council.[29] Xie confirmed some basic elements of the current plan but was short on details—not confirming which sector(s) would be initially covered or how allowance prices would be set. Later during the summit, a former NDRC official suggested that the national system would have no compliance obligations for the first two years, making it a truly soft launch geared more to getting market rules and operations in place than to having a discernable climate change impact.[30] The former official went on to predict that the power sector would be joined by cement and nonferrous metals if the market proved ready by 2019, and that hard compliance deadlines would come only in 2020.[31]

Thus, the precise shape of China's national ETS remains unclear. The multiple delays, changes, and ambition rollbacks throughout its creation phase mean caution should be taken when speculating about its launch date and characteristics. While it is clear that China's national market remains rife with uncertainty, and the hurdles it faces are surmountable, government commitment to the market—while at times cautious

—is not wavering. China is crafting and testing a national system with long-term goals in mind and has repeatedly proven willing to scrap near-term plans and initial ambitions in the search for a palatable policy framework. As the NDRC develops technical rules on reporting and verification, trading, offsetting, and the like, third-party consultants, verifiers, trading platforms, and knowledge centers seek to increase their ability to support market activities.

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The at times plodding soft-launch approach is an extension of the piloting experience that underpins the national market, which will remain fluid in its design for years to come. Ultimately, the national rollout will present not a fully fleshed-out market, but a vital symbolic and practical step toward a future ETS with wide-ranging coverage and voluminous future trading potential.

2.4 INTERNATIONAL AND REGIONAL IMPLICATIONS

Outside its borders, China's ETS will impact international carbon trading and climate mitigation efforts in yet untold ways. The scale of its market and presence of covered industries in international supply chains means that China's ETS will have myriad impacts on trade, competitiveness, and carbon prices in other markets around the world.[32] China is also uniquely placed to pursue market integration efforts in Northeast Asia.

Targeted links connecting Northeast Asian markets would widen the emissions-reduction options available for emitters and help provide the scale and liquidity needed for robust trading platforms. Such links would also reflect the economic connections that define much of Asia and the global economy and discourage the leakage of emissions to less regulated jurisdictions. For China, market cooperation and selective links could lead to revenue generation as it sells credits to neighbors that face higher abatement costs and could yield geopolitical dividends as a form of regional and international climate change leadership. These possibilities and pathways for pursuing them are explored further in Section 5 of this paper.

These efforts hinge on their capacity to forge symbiotic relationships that contribute to disparate national interests in Northeast Asia and beyond.[33] Such relationships will require patient experimentation and creative bargaining and restrictions across jurisdictions. China's willingness to entertain future ETS connections is essential and while Beijing is understandably fixated on its domestic rollout, indications suggest it is doing just that. Xie Zhenhua weighed in on the issue of market linkage at the 2017 Bonn climate summit, saying that China must "set the foundations before we build the upper floors" of the house that is China's carbon market, suggesting that linkage efforts at this juncture would be premature. Clearly China will be cautious regarding any linkage timeline, but its openness to cooperation with a longer view in mind is promising.

Timing is key, and, as Section 6 will argue, establishing the basis of regional carbon market cooperation at early stages is essential for making future linkage possible. Before that, the following section will explore Japan's path toward carbon market adoption, and the trends that are making future Japanese regional carbon market engagement more logical and likely.

3. JAPAN'S NEED FOR CARBON MARKET CONNECTIONS

JAPAN'S RESPONSE TO THE 2011 FUKUSHIMA NUCLEAR CRISIS is fundamentally altering its approach to energy security, climate mitigation, and by extension the role that carbon pricing plays and is likely to play in the country. Nuclear power was poised to become Japan's keystone energy source. In 2007, then—and now again—Prime Minister Shinzo Abe helped launch the Cool Earth 50 initiative that in conjunction with the influential Ministry of Energy, Trade, and Industry (METI) presented a plan for reducing CO_2 emissions 54 percent from 2000 levels by 2050 and 90 percent by 2100.[34] The plan called for nuclear power contributing roughly 60 percent of primary energy in 2100, with 30 percent coming from fossil fuels and 10 percent from renewables—a scenario in which the nuclear sector would be responsible for more than half of Japan's twenty-first-century emissions reductions.

The Fukushima disaster shelved these plans in their infancy. Since 2011, nuclear power has been removed and then very sparingly reintroduced in Japan's energy mix, and its future remains tenuous and controversial in the face of continuing public opposition. Short of major policy changes, it will not reach pre-Fukushima levels in the foreseeable future, much less expand at the rates previously envisioned. Japan has made up the balance primarily through energy conservation and efficiency gains, moderate growth in renewables, and a substantial current and prospective increase in fossil-fuel consumption.

Japan faces steep obstacles to ambitiously lowering its emissions in lieu of increasing its carbon market activities.

These trends create questions about how Japan will meet its current and future climate change mitigation goals. Its existing Nationally Determined Contribution (NDC) on climate change calls for a 26 percent emissions reduction below 2013 levels by 2030 and an 80 percent reduction by 2050, which is a moderate to low-level of ambition compared to Japan's international peers (see Figure 4 for Japan's NDC in the Northeast Asian context). Like all parties to the Paris Agreement, Japan is expected to ratchet up its ambition over time. Carbon market mechanisms have the potential to play a larger part in Japan's efforts to do so than is currently the case.

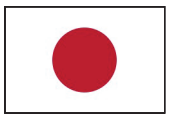
Japan faces limited options for reducing emissions. It is a victim of its own success on energy efficiency, where impressive past progress diminishes opportunities for future, cost-competitive, efficiency, and conservation gains. With its prior focus on nuclear power as the emissions answer now compromised, Japan could rapidly scale-up renewables through subsidies, feed-in tariffs, innovation investment, carbon markets, or some combination of these and other approaches. But as the following sub-section demonstrates, it faces steep obstacles to ambitiously lowering its emissions in lieu of increasing its carbon market activities.

Extending carbon market connections beyond its borders offers a promising pathway. Japan already pursues international climate mitigation action through its Joint Crediting Mechanism (JCM), which facilitates investment in emissions-reducing actions in developing countries in exchange for offset credits.

FIGURE 4. THE NATIONALLY DETERMINED CONTRIBUTIONS OF NORTHEAST ASIA

CHINA

- Peak carbon emissions around 2030
- Reduce carbon intensity to 60 to 65% from the 2005 level by 2030
- Increase the share of non-fossil fuels in primary energy consumption to 20% by 2030
- Expand forested land



JAPAN

- GHG emissions reduction of 26% by FY 2030 compared to FY 2013 (25.4% reduction compared to FY 2005)

KOREA

- GHG emissions reduction by 37% from business as usual by 2030 – includes the use of carbon credits from international market mechanisms

Source: National Determined Contribution Registry, United Nation Framework Convention on Climate Change, accessed November 14, 2017, www4.unfccc.int/ndcregistry/Pages/All.aspx.

By widening the geographical and sectoral coverage of its domestic carbon markets, and exploring links to other regional markets that extend beyond offsets, Japan could extend the cost-effective options for pursuing more ambitious climate change goals.

3.1 FUKUSHIMA DISRUPTS JAPAN'S EMISSIONS PLANS

More than six years since the Fukushima nuclear disaster, the accident continues to loom over Japanese energy decisions. Its material impacts are substantial—with a late-2016 cost estimate of roughly USD 188 billion (twice the previous estimate) and only 13 percent of the 100,000 displaced having returned home.[35] More relevant for Japan's emissions future, the disaster undermined public confidence in the safety of nuclear power.[36] Prior to Fukushima, Japan operated 54 nuclear reactors to produce roughly one-third of its electricity. After the meltdowns, Japanese utilities shut down the remaining 50 intact reactors one-by-one, and the then-Prime Minister Yoshihiko Noda announced that while some reactors would come back online in the short term, the government would phase out nuclear power by 2040 (this has since been amended, as discussed in the following paragraphs). Despite a new Nuclear Regulatory Authority being established in 2012 to usher in tougher standards, public acceptance of a nuclear future remains elusive.

Japan has significantly increased coal and liquefied natural gas (LNG) consumption to make up the energy missing from the nuclear sector, and questions remain about whether this replacement will constitute its future energy trajectory. A 2015 METI report called for nuclear energy to account for 20 to 22 percent of power generation by 2030, with 22 to 24 percent coming from renewable energy sources, 26 percent from coal, 27 percent from LNG, and 3 percent from oil.[37] In March 2016, Prime Minister Abe declared that Japan "cannot do without nuclear power" in its efforts to secure affordable energy while also addressing climate change.[38] METI will seek approval for its next national energy plan (which it must produce every three years) in March 2018, and it will contain a role for nuclear power.

Yet even with current high-level support for some nuclear retention, countervailing public pressure cannot be discounted. A 2015 poll by industry advocates found that nearly half of respondents thought nuclear power should be abolished gradually, roughly 15 percent favored immediate abolishment, and only 10 percent thought it should be maintained.[39] A 2016 *Asahi Shimbun* poll is even more critical, with 57 percent of respondents opposing the use of existing nuclear plants even if they met new regulatory standards, 73 percent in favor of a nuclear phaseout, and 14 percent calling for an immediate shutdown.[40] Public opposition will not lead to a full nuclear rollback in the near term, but its prevalence more than six years after the 2011 meltdowns suggests staying power and is likely to limit its presence and eliminate its growth in Japan's longer-term energy mix.

Meanwhile, the Fukushima disaster accelerated Japan's energy conservation and efficiency efforts alongside fossil fuel imports. A tighter electricity supply-demand balance and energy price volatility in the wake of the disaster led METI to declare that "the importance of energy conservation in the residential sector" being "recognized again" at policy levels.[41] Total electricity demand has fallen since 2011, and the price of electricity—which spiked by more than 20 percent in 2012–2013—has stabilized and even declined.[42] This decreased demand is partially filling the void left by waning nuclear capacity, while fossil fuels fill the rest, with imported coal and natural gas meeting 75 percent of Japan's energy needs by mid-2015, up from 54 percent prior to the meltdowns.[43]

It will be difficult for renewables to displace fossil fuels as the core nuclear replacement strategy in the near term. Renewables face barriers to accessing Japan's power grids. Nuclear and fossil fuels are considered baseline sources and given priority in grid access, with renewables typically being switched off first and without compensation in the event of excess power.[44] This is the opposite of the way most European and many American grids are managed, which give preference to low cost-of-production renewables first and make up the difference, when necessary, using traditional fuels.

Continuing investment growth in Japanese renewables is also far from guaranteed. After Fukushima, the government of Japan (GOJ) incentivized investment through feed-in-tariffs (FIT), in which the government commits to supporting renewable energy purchases at above-market rates over a determined period of time. As a result of share of solar in the energy mix of Japan's 10 largest utilities rose from 0.4 percent in 2012 to 3.4 percent in 2015.[45] But utility opposition led the FIT to subsequently be scaled back, leading to dwindling solar sales and rising bankruptcy among solar companies. Large-scale projects in wind and geothermal (where Japan has strong potential) face public pushback on land-use grounds along with onerous regulatory hurdles, while the most promising hydropower sources are already developed. Meanwhile, Japan may increase coal-burning power stations by 50 percent in the next 20 years, going against the trajectory pursued by its developed economy peers.[46]

Barriers to faster and more significant renewable expansion in Japan are not insurmountable, and problems today should not lead to hard and fast determinations about the future. But these barriers show that Japan is not currently on track to replace nuclear with low-emissions energy, and they amplify questions about Japan's ability to meet its climate change targets—particularly from now until 2030. Carbon markets are relevant on two broad fronts in this context. First, broadening domestic carbon market coverage would change the financial calculus surrounding renewables. It would not negate the regulatory and grid issues currently challenging the sector, but it could assuage problems resulting from the rolled-back FIT and make renewables more cost competitive. Second, expanding regional and international carbon market cooperation and connectivity would create emissions-reduction options that circumvent Japan's current domestic limitations. The country has a foundation on which to build.

Barriers to faster and more significant renewable expansion in Japan are not insurmountable, and problems today should not lead to hard and fast determinations about the future.

3.2 THE TOKYO ETS – POSITIVE RETURNS ON MODEST AMBITION

Northeast Asia's first ETS was launched in 2010 by the Tokyo Metropolitan Government (TMG). It built on a 2002 measure requiring large-scale office buildings and factories to report and submit their emissions-reduction plans along with a reduction target and measures to achieve it.[47] The program compelled the TMG to build up stores of high-quality emissions data and helped government officials grow competencies on energy savings, efficiency, and monitoring and reporting operations. Methods for evaluating the mechanism, which was housed under the "Program for Reporting on Measures against Global Warming," continued to improve as the 2000s progressed.

The 2010 ETS was a logical extension of this reporting and monitoring foundation. The large offices and factories covered by the scheme[48] were required to reduce their emissions by 6 to 8 percent during the first compliance period (2010–2014).[49] In 2015, the Tokyo ETS upped these reduction requirements to 15 to 17 percent for its second implementation period, which it was able to do in large part because of 2010–2014 successes. The TMG reports that total emissions from covered entities dropped every year during the first compliance period, with a 25 percent reduction in 2014 and total reductions of 14 million tons of CO_2.[50] All covered facilities met their 6 to 8 percent reduction targets, and more than 90 percent exceeded them.

The TMG's takeaway from these achievements was that "facility owners in Tokyo can see the long-term benefits of reducing energy use and have already taken steps to realize those goals."[51] This is certainly true; the efficiency gains required by the Tokyo ETS make economic sense in their own right. They are likewise in-line with Japan's previously discussed emphasis on efficiency as a pathway toward energy security (a prominent 2016 report ranked Japan's energy efficiency second worldwide).[52]

Despite these successes, the discrete impacts of the Tokyo ETS are difficult to determine. The complete compliance enjoyed during the 2010–2014 period, while laudable, also reflects modest ambition. Increasing

emissions-reduction targets more than twofold during the current compliance period is a noteworthy response, but it may still present only muted signals to covered entities, 76 percent of which had already exceeded the second-period targets (15–17 percent) before it began.[53] With high internal compliance rates, trading has been thin. Only 9 percent of covered facilities have traded credits, and 60 percent of these credits were exchanged by facilities under the same corporate umbrellas for free.[54] The Tokyo ETS has no aggregated trading platform, with all transactions taking place over-the-counter (OTC) with no obligation to disclose transaction prices.[55] TMG surveys offer a window into results that are unsurprising: the average transaction price for credits fell from JPY10,000/ton in 2011 to JPY1,500/ton in 2016 due to lack of demand.[56]

For the Tokyo ETS to expand its impact, it must send stronger price signals through more ambitious mitigation requirements. This may seem an unfair critique given the recently increased requirements, but the low starting point combined with the efficiency push created by Fukushima means that significantly steeper targets will be needed during future phases. Only by moving further beyond business as usual scenarios for covered entities can the Tokyo ETS send more impactful price signals, and be more relevant in changing behavior and emissions levels.

Japan would also benefit from increasing coverage, both sectorally and geographically. The barriers to sectoral expansion are political will and the ability to gain necessary industry buy-in. While formidable, such barriers are also ubiquitous to the development and expansion of any ETS. The Tokyo experience reduces the additional challenges that come with ETS design and operations, which the TMG now has demonstrable capacity to execute. Geographically, the Tokyo ETS has already shown the ability to enter partnerships with other jurisdictions, agreeing in September 2010 to link with the fledgling ETS in Saitama Prefecture.

Only by moving further beyond business as usual scenarios for covered entities can the Tokyo ETS send more impactful price signals, and be more relevant in changing behavior and emissions levels.

The Saitama ETS has design elements unique from those in Tokyo, including on coverage, reduction requirements, and other fundamental issues, but still the jurisdictions successfully linked in April 2011. Credits from excess emissions reductions and Small and Mid-size Facility Credits are eligible for trade, and transfers between city and prefecture occurred in both directions during the first compliance period.[57] The Tokyo-Saitama link offers a pathway to broaden carbon markets in Japan without a top-down national scheme. Tokyo is the largest and Saitama the fifth-largest prefecture in Japan by GDP, and the top five prefectures represent more than 40 percent of the Japanese economy. Under the right circumstances (discussed in Section 4 of this report), these subnational schemes could take advantage of international linkage possibilities.

There is also a foundation for increasing carbon market coverage in Japan through national policy. As with the Tokyo ETS, past experiences at the national level provide useful capacities—both for instituting a mandatory national system and for scaling-up Japan's existing international engagement.

3.3 BASIS AND PROSPECTS FOR A NATIONAL SCHEME

The GOJ has experimented with national ETS mechanisms for most of two decades. During the 2000s, the government implemented the Japan Voluntary Emissions Trading Scheme (JVETS), an Experimental Integrated ETS, and two offsetting systems that provided credits internally and from abroad, respectively.[58] These measures were geared toward Japan's meeting its Kyoto Protocol commitment to reduce emissions by 6 percent from 1990 levels by 2012, and longer-term targets of a 25 percent reduction by 2020 and an 80 percent reduction by 2050. The JVETS called on participating firms, which were already compelled to monitor and report their GHG emissions, to set either absolute or intensity-based targets and to use allowances to comply.[59]

JVETS covered emissions from industrial processes, office energy consumption, and waste management. Participants submitted corresponding Japanese Emissions Allowances (JPAs) for every ton produced, and firms falling below their established caps could sell these allowances to other participants. JVETS participants became part of the Experimental Integrated ETS in 2008, and from 2009 they received subsidies for installations that produced energy savings.[60] In its final phase in 2012, the JVETS had 389 participants and reduced emissions just under 60,000 tons.[61] The average allowance trading price was roughly USD 2.60, and at its peak JVETS covered 0.3 percent of 1990-level emissions.[62]

The JVETS was designed under Japan's Basic Act on Global Warming Countermeasures to build the foundation for a mandatory national ETS.[63] The low trading prices and limited coverage resulted from the JVETS being a trial system meant to lead to future mechanisms that would be more compulsory and wider in ambition and impact. Two developments disrupted this momentum toward a national ETS. First, the GOJ declined to sign up for a second commitment period under the Kyoto Protocol during the Cancun climate negotiations in late 2010. International uncertainty and debate about whether the Kyoto Protocol should continue or be replaced abounded at the time; in removing itself from a second commitment phase, Japan undermined the emissions targets underpinning its ETS mechanism. Second, the Fukushima disaster led Japan to significantly revise downward its previous emissions-reduction targets—from 25 percent below 1990 levels by 2020 to 3.8 percent below 2005 levels by 2020.[64] The final reversal of what had previously appeared to be a JVETS-led march toward a national system came at the end of 2012 when Prime Minister Yoshihiko Noda dissolved Japan's Lower House and the proposed national ETS was formally abandoned.[65]

Other national emissions-crediting approaches rose from these ashes. The Japanese Verified Emissions Reduction (J-VER) was an offset mechanism launched in 2008 that merged in 2013 with Japan's Internal Crediting system to form the J-Credit Scheme. The J-Credit Scheme—which is still operational—facilitates the trade of government-certified offset credits derived from implementing energy-saving equipment, the use of renewable energy, and GHG abatement through forest management inside Japan.[66] Participating firms can use these credits in their required emissions reporting, and for compliance under voluntary systems such as Keidanren's "Commitment to a Low-Carbon Society," which is designed to reduce industrial and energy sector emissions through company-level reductions.[67] The point of the J-Credit Scheme is to offer government oversight and management, shared by METI, the Ministry of Environment (MOE), and the Ministry of Agriculture, Forestry, and Fisheries, that encourage and facilitate voluntary emissions reductions through domestic offsets.

The J-Credit Scheme lives on while momentum toward a national ETS in Japan has stalled because offset schemes are less politically fractious than mandatory cap-and-trade systems. Offset schemes—especially when utilized for voluntary and non-punitive reporting—are more easily viewed as non-zero-sum approaches to emissions reductions that have few onerous burdens on participants. Cap-and-trade is predicated on maximizing one's position in the context of wider aggregated targets and requirements. While the JVETS stopped short of this level of compulsoriness, it was designed as a step toward a national scheme with more teeth and impact, and it became a predictable casualty of Japan's declining climate change commitments as political winds changed and Fukushima posed new challenges.

Future prospects for a national ETS in Japan are mixed. The MOE joined the World Bank Carbon Pricing Leadership Coalition (CPLC) in 2016 and has been active internationally on the development of carbon-pricing systems. The MOE is also supporting research and dialogue that scopes out the prospects for and potential impact of a national system.[68] Experiences with JVETS in particular create relevant competencies in Japan for MRV, third-party verification, and the creation of a registry for emissions trading.

Still, no clear plans are being pursued at high levels of the GOJ to suggest that a national ETS will launch in the foreseeable future. This does not preclude regional or international engagement, however. Rather, integrating Japan into regional and international carbon market cooperation is possible in the near term both through offsets and the TMG scheme, and the likelihood that Japan ultimately implements a national system could well increase through such engagement.

3.4 INTERNATIONAL ENGAGEMENT

Japan was an early adopter of international strategies to offset its emissions through investment and project development. The Joint Credit Mechanism (formerly the Bilateral Offset Crediting Scheme) allows Japanese firms to invest in emissions-reducing projects and programs in developing countries. Part of the resulting emissions reduction is accounted by the recipient country, and part accrues to Japan as offset credits.

The JCM is a scaled-down version of the global Clean Development Mechanism (CDM), which similarly facilitates developed countries meeting their commitments under the Kyoto Protocol through offset projects in developing states. The JCM uses CDM methodologies where possible, while taking a more simplified overall approach.[69] A Joint Committee (JC) of representatives from Japan and recipient governments develops specific rules and implementation guidelines, designates third-party verifiers, registers projects, and determines the amount of offset credits that will be issued in each case. The JC decentralizes governance compared to more top-down CDM approaches and seeks to create mutually beneficial projects that are appropriately tailored to the host country's needs and preferences.

The JCM is helping Japan become a global leader in offsetting. Since its 2013 launch, it has formed partnership agreements with 17 recipient countries and registered 19 schemes. Being in their relative infancy, these projects have yielded small amounts of JCM credits—but these could accelerate rapidly. The GOJ aims to generate some 50–100 million JCM credits through 2030 and will likely redouble these efforts once the Paris Agreement rules on market mechanisms are finalized.[70] This acceleration implies a strategic shift in how Japan views and leverages the JCM. Traditionally, it has been largely a vehicle for exporting Japanese low-carbon technology, products, services, and infrastructure to contribute to sustainable development in

developing countries. Its role in Japan's climate mitigation strategy has been ever-present but comparatively less important. This is shifting, with the JCM poised to become a core element of how Japan meets its present and future NDCs.

The forces behind this shift are the same as those that make Japanese carbon market cooperation in Northeast Asia strategically sound: Japan's current domestic trajectory will make it difficult to achieve ambitious emissions reductions without scaling-up international market cooperation. The MOE recognizes this reality; in its 2017 long-term vision for addressing climate change, it calls on carbon pricing and market mechanisms to provide cost-effective tools for reducing emissions while spurring innovation.[71] So too do major Japanese corporations, which are purchasing carbon offsets without mandatory caps compelling them to do so. For example, in response to a greater focus on environmental issues by institutional investors, Sony has announced plans to purchase 70,000 offsets from the J-Credit Scheme, Shumizu is buying CDM credits in its efforts to become carbon neutral, and major utility and construction firms (Osaka Gas and Obayashi) are exploring various offset market options.[72] As JCM credits become more available, an additional growing offset pool will open up to the corporate sector.

Market connections in Northeast Asia are a potentially high-value conduit through which Japan can pursue its future climate mitigation strategies.

Market connections in Northeast Asia are a potentially high-value conduit through which Japan can pursue its future climate mitigation strategies. Its admirable efficiency gains should continue but will slow down and become more expensive as the country makes progress. Japan's ability to scale-up domestic renewable energy is mixed and in any case could be aided rather than eroded by deepening market connections. The future of its nuclear sector is uncertain, but it clearly will not reach the national coverage envisioned during the pre-Fukushima era. Market connections with Korea and particularly with China offer pathways for Japan to access lower-cost emissions-reduction options than those it enjoys domestically. The report will explore how, after considering further the Korean situation.

4. KOREA MOVES FIRST ON A NATIONAL ETS

KOREA EXPERIENCED UNPRECEDENTED ECONOMIC GROWTH over the past half century and transitioned from one of the poorest states in the 1950s to the world's 11th-largest economy in 2016.[73] Reforms during the 1960s transformed Korea's economic structure to foster investment in infrastructure and industrial development—which resulted in fast growth of heavy and chemical industries in the 1970s and 1980s. In the 1990s, Korea successfully pivoted to digitization and by the twenty-first century had become the only country in the world to move from a recipient to a provider of official development assistance (ODA).[74]

This rapid industrialization and modernization had serious socioeconomic impacts including an increase in pollution and energy dependence. Korea's energy-intensive and export-oriented economy left the nation vulnerable to fluctuating energy prices. Following the aftermath of the first and second oil shocks in the 1970s, Korea attempted to promote energy diversification and energy savings through the Rational Energy Utilization Act of 1979. Despite these energy conservation efforts, the Korean economy continued to rely heavily on fossil-fuel–based energy consumption—98 percent of which came from foreign reserves—and ranked among the largest energy consumers globally from the 1990s onward.[75] Meanwhile, anthropogenic pollution progressively increased; in 2009, Korea recorded the highest increase in greenhouse gas (GHG) emissions among the Organisation for Economic Co-cooperation and Development (OECD) countries—with a growth rate of 128 percent compared to its 1990 emissions level.[76]

Entering the twenty-first century, Korea embarked on a new growth strategy that deeply embedded climate change in its economic and governance structure. In 2008, President Lee Myung-Bak announced "low carbon, green growth" as the country's new development paradigm during his inauguration speech, and he established the Presidential Committee on Green Growth (PCGG) to pursue myriad climate-friendly policies. The PCGG, composed of policy makers and private sector experts, was mandated with developing a comprehensive green growth strategy and implementation plan at the international, national, and sectoral levels. In 2009, Korea made a series of announcements that placed the country as a global climate leader. During the Copenhagen Accord, Korea pledged to reduce GHG emissions by 30 percent below business as usual (BAU) levels by 2020—the highest recommended mitigation target for a non–Annex 1 country. The Korean government also unveiled the National Strategy for Green Growth (2009–2050) and the First Five-Year Action Plan (2009–2013). This comprehensive mitigation strategy was later institutionalized in the 2010 Framework Act on Low Carbon Green Growth (LCGG)—landmark legislation that provided a solid ground for the introduction of a nationwide ETS in Korea (KETS). Although other relevant legal frameworks were introduced under the LCGG—including sustainable transportation, green buildings, and green consumption—the KETS transformed the way Korea approached climate change and emissions-reduction policies. It offered a tool to drive behavioral change throughout the country's large emitters.

Entering the twenty-first century, Korea embarked on a new growth strategy that deeply embedded climate change in its economic and governance structure.

4.1 BUILDING THE KETS

Before the KETS, Korea pursued emissions reduction primarily through energy conservation and voluntary emissions-reduction policies. The oil shocks in the 1970s and the 1997 Asian Financial Crisis compelled the government toward energy diversification and efficiency, as well as improving its trade performance through lowering fossil-fuel imports. In 1997, Korea signed onto the Kyoto Protocol as a non-Annex I country and began to explore the options for voluntary GHG emissions reduction. This included the introduction of the voluntary agreement (VA) on energy conservation and GHG emissions reduction in 1998, the revision of the Rational Energy Utilization Act in 2003 to incorporate the promotion of GHG emissions reduction, and the introduction of the Korea voluntary emissions reduction (KVER) in 2005.

The VA on energy conservation and GHG emissions reduction was initiated by the Ministry of Industry and Energy (now known as Ministry of Trade, Industry, and Energy: MOTIE) and provided technical support and financial solutions to participating companies through tax incentives and resources for energy-efficiency projects. The KVER was a project-based reduction program that was designed based on the Clean Development Mechanism (CDM) and was the first GHG emissions-reduction registration system among the non–Annex I countries. Approved projects were issued with certified emissions reduction (KCER), which could be sold to the government or traded in a market. Although these energy conservation and voluntary actions did not lead to significant reductions in GHG emissions, they paved the way for a nationwide ETS by providing the government with information on baseline energy consumption and the abatement costs of industries.

In 2008, Korea reached a turning point in its GHG reduction policies by declaring low carbon green growth as the country's new growth strategy. A low carbon green growth paradigm was officially adopted to align economic growth with climate mitigation and to contribute to global efforts on climate change. This vision was encoded in the 2010 Framework Act on Low Carbon Green Growth, which established the institutional framework for the implementation of mitigation actions on the national, local, and sectoral levels. The LCGG harmonized all low carbon, green growth policies of Korea—taking precedence over previous energy- and climate-related acts and providing the legal basis for new policies including the establishment of a nationwide ETS.[77]

The KETS was legally established by the Act on the Allocation and Trading of Greenhouse Gas Emissions Allowances, which was enacted in 2012 and came into effect in 2015. Beginning in 2012, the Korean government implemented the Greenhouse Gas and Energy Target Management System (TMS), which required energy-intensive enterprises to report and reduce their GHG emissions and served as a precursor to the KETS. It was adopted to improve the operational capacity of the ETS, including the establishment of a robust GHG inventory and MRV system. The criteria for the sectors and entities covered under the TMS were consistent with those covered under the KETS.[78] However, unlike the KETS, the TMS was a command and control system that operated under a one-year compliance period, in which entities were required to submit reduction targets and received third-party verification at the end of the year. Additionally, no single authority regulated the TMS, with controlled entities instead reporting to their relevant ministries. Entities that did not comply with the TMS were fined up to 10

FIGURE 5. KOREA'S ENERGY AND CLIMATE POLICY MILESTONES

1979	Enacts the Rational Energy Utilization Act	Energy conservation
1998	Introduces the Energy Target Management System Introduces the Voluntary Agreement on Energy Conservation and GHG Emissions Reduction	
2003	Revises the Rational Energy Utilization Act to include the promotion of GHG emissions reduction	Voluntary GHG mitigation
2005	Introduces the Korea Voluntary Emissions Reduction	
2008	Declares "low carbon, green growth" as the national development paradigm Establishes the Presidential Committee on Green Growth	Legal framework and harmonization of climate policies
2009	Pledges GHG emissions 30% below BAU levels by 2020 (Copenhagen Accord) Unveils the National Strategy for Green Growth (2009–2050) and its First Five-Year Action Plan	
2010	Enacts the Framework Act on Low Carbon Green Growth Enacts the Greenhouse Gas and Energy Target Management System	
2012	Enacts the Act on Allocation and Trading of Greenhouse Gas Emissions Allowances Launches the Target Management System as a precursor to the ETS	Mandatory GHG reporting and mitigation
2014	Reveals the Master Plan for the Emissions Trading Scheme and Phase I National Allowances Allocation Plan	
2015	Launches a nationwide ETS – Phase I (2015–2017) Sets NDC GHG emissions reduction target of 37% below BAU levels by 2030 (Paris Agreement)	

million KRW.[79] In 2015, the KETS replaced the TMS; however, it was not completely abandoned and instead, was expanded to cover smaller business and facilities.[80] Figure 5 illustrates the milestone of Korea's energy and climate-related policies.

4.2 THE KETS MOVES FORWARD DESPITE REGULATORY AND MARKET UNCERTAINTIES

The KETS currently covers approximately 68 percent of Korea's GHG emissions in 26 sub-sectors with 600 entities and is structured in phases: Phase I (2015–2017), Phase II (2018–2020), and Phase III (2021–2025).[81] It is currently the second-largest ETS in the world, and by 2020 the system will be deeply rooted in Korea's climate policy as its primary mitigation tool. Characteristics of the first phase include grandfathering-based allocation methods, 100 percent free allocation, the development of MRV mechanisms, and the pursuit of technical-level cooperation with other systems including the EU, China, and Japan. During Phase II, the KETS will allow trading by third parties; by Phase III, it will allow more than 10 percent of its allowances to be auctioned, adopt international MRV standards, and consider linking its system with those of other ETSs.

The KETS is designed to be adaptable and uses banking, borrowing, and offset mechanisms to ensure flexibility. An Emission Allowance Allocation Committee (EAAC) can implement market stabilization measures to adjust the scope of the flexibility mechanisms when specific price-based triggers are met. These market stabilization measures are not rule based or nondiscretionary; rather, they will only be implemented if the EAAC decides that triggering conditions have been met.[82] In addition, in order to mitigate leakage effects, the KETS allows free allocation to energy-intensive and trade-exposed (EITE) sectors throughout all phases. EITE entities meet the criteria of having a (1) trade intensity level of 30 percent or higher, (2) production cost rate of 30 percent or higher, and (3) trade intensity level of 10% or more and production cost rate of 5% or more.[83]

Performance of the KETS has been mixed. Since its inception in January 2015, the carbon price in Korea sharply increased, whereas the traded volume remained low.[84] In early February 2017, the Korean Allowance Units (KAUs) cleared at 26,500 KRW—more than twofold the 2015 average clearing price of 11,774 KRW—despite the Korean government's announcement that an additional 17 million allowances would be allocated.[85] Moreover, only 2.3 percent of the total cap was being traded, according to the aggregated market statistics from January 2015 to June 2016.[86] Factors contributing to the sharp increase in carbon prices and low market liquidity include excessive banking by companies in anticipation that free allowances will decrease in the future, limits to third-party market participation, and regulatory uncertainty emerging from frequent market interventions by the government.[87] In part because of these limitations, Korea is not currently on track to meet its 2030 mitigation target of 37 percent below BAU levels.[88]

In April 2017, Korea's Ministry of Strategy and Finance (MOSF) implemented a set of market stabilization measures to address the weakened structural imbalance between supply and demand. Major changes included restrictions on banking that penalize entities for excessive carryover, increases in the borrowing ratio, and the decision to accelerate the introduction of international market mechanisms from a start date of 2021 to 2018.[89] Since the EAAC's decision to implement the market stabilization measures and up until early October 2017, KAUs traded at an average price in the lower end of 20,000 KRW.[90] From mid-October, prices increased gradually and on November 14, 2017, the market price sharply increased by 5.12 percent in one day.[91] On November 23, 2017, the spot market price of KAUs at KRX closed at a record-breaking price of 28,000 KRW—an increase of 16.7 percent compared to the previous week, and by 34.6 percent since October 10, 2017.[92] Market analysts forecast that the KETS will soon hit the 30,000 KRW mark if this upward trend continues.[93]

Since President Moon took office, the Korean government has pledged to ambitious climate goals, including the gradual phasing out of nuclear and coal power plants, and boosting the share of Korea's renewables to 20 percent by 2030.[94] President Moon also expressed that by 2020, the KETS will be deeply rooted into Korea's climate mitigation agenda.[95] To align the KETS with the government's nuclear and coal phase-out plans, the Moon administration transferred the authority of the KETS back to the Ministry of Environment and delayed the unveiling of the Phase II allocation plan—which was originally planned for June—to be introduced at the end of the year. The sharp increase in the carbon price from October stems from the following regulatory uncertainties: (1) five-month delay of the Phase II allocation plan without a specific release date and (2) concerns emerging among the industries that the ETS may take the shape of a regulatory mechanism rather than a market-based mechanism under the Ministry of Environment.[96]

On November 24, 2017, the Korean government convened a public hearing to discuss and gather opinions from the industries on the second phase allocation plan. During the hearing, the government made several important announcements including (1) allocation levels for 2019 and 2020 will be postponed to 2018 and only the 2018 allocation plan will be announced before the end of 2017; (2) the second phase will include auctioning up to 3 percent, but auctioning of units will begin in 2019 and allowances will continue to be allocated for free in 2018; (3) the third phase will auction 10 percent of the allowances.[97] Although the industries were relieved that 2018 would be excluded from auctioning, many expressed frustration at the government's decision to only unveil the 2018 allocation levels this year. The Korean government suggested these decisions were made to account for the new direction in the country's energy and climate policy.

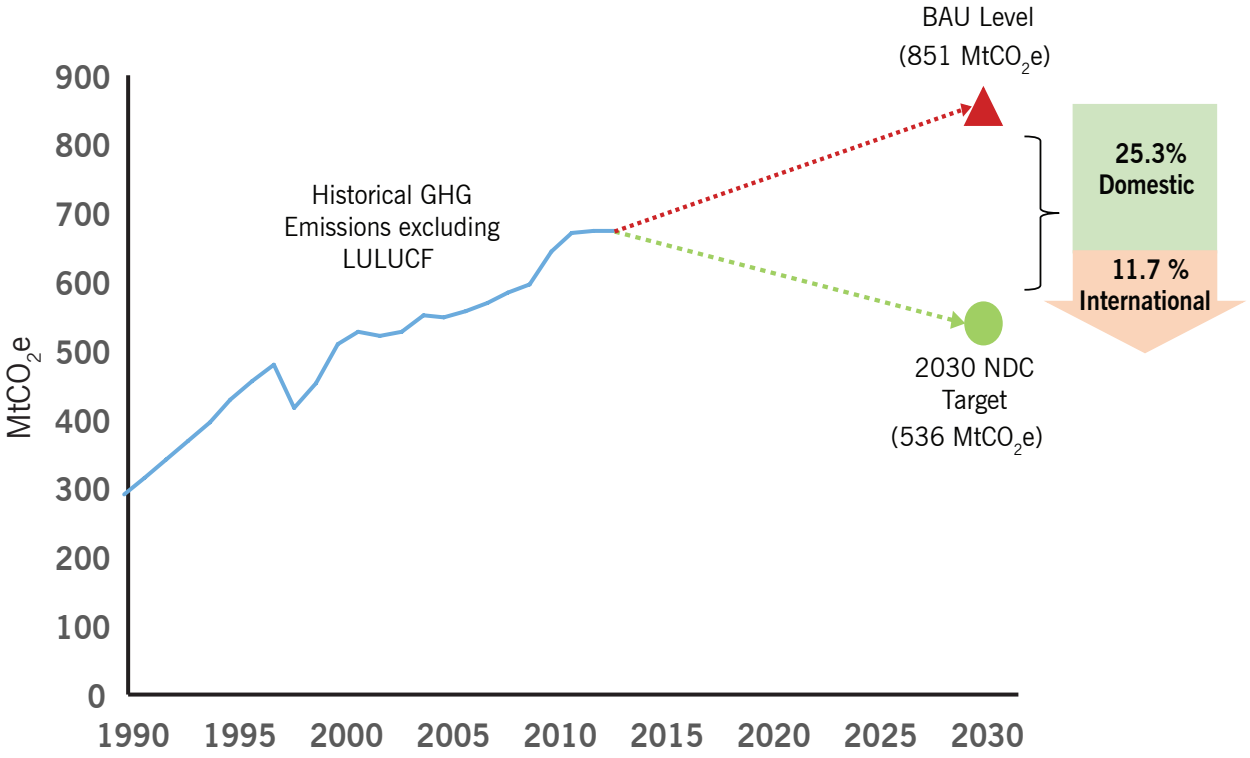
The KETS will become a core instrument of Korea's climate mitigation agenda as the country strives for more ambitious climate policies under President Moon.

Despite recent experiences in regulatory and market uncertainties, the KETS is moving forward as planned. Additionally, the KETS will become a core instrument of Korea's climate mitigation agenda as the country strives for more ambitious climate policies under President Moon. Korea's 2017–2036 Climate Change Basic Plan seeks to transition to a low-carbon economy and identifies carbon markets as the most cost-efficient means of reducing GHG emissions. The plan sets the policy foundation for Korea to combine an effective domestic carbon market and the use of international market mechanisms.[98] This political momentum provides an enabling environment for Korea to be at the forefront of regional and international carbon pricing, which could pay substantial economic, environmental, and geopolitical dividends.

4.3 KOREA'S BET ON INTERNATIONAL CONNECTIONS

For a Korean market that is smaller than those of some present and future peers, expanding market size through carbon market linkages could lessen the inelasticity of its market, generate more liquidity, and offer more reliable price signals.[99] And with Korea specifying that 11.3 percent of its 37 percent mitigation target will be achieved through international markets, the KETS will grow in relevance through future international connectivity (see Figure 6).[100] Although the Korean government has yet to finalize its plan for using international market mechanisms, recent expert and diplomatic exchanges on carbon markets in Northeast Asia indicate that trilateral linkage could expand on regional political agendas in the near future.[101]

FIGURE 6. KOREA'S HISTORICAL GHG EMISSIONS AND 2030 MITIGATION TARGET



Source: World Resources Institute, "CAIT Climate Data Explorer," accessed August 21, 2017, http://cait.wri.org.

Korea accounts for roughly 1.6 percent of Northeast Asia's 30 percent of global emissions,[102] and it is through helping to connect the carbon markets in Northeast Asia that Korea can best strengthen regional mitigation efforts. As the benefits of linkage create lower-cost mitigation options, Korea and its regional neighbors may be in a position to set more ambitious mitigation goals in the future. As such, the Korean government is supporting studies that seek to project wider linkage impacts.

Quantitative modeling bears out some key potential linkage benefits in Korea and estimates that market linkages with Japan and China could increase Korea's real GDP while significantly decreasing average abatement costs.[103] These models further suggest that the distributional impacts of such links would be unbalanced among the three countries, with Korea potentially facing some negative consequences as a net buyer of credits.[104] Therefore, complementary policies that restrict the extent of market links would be required for Korea to capitalize on the benefits of linkage while avoiding its pitfalls.[105]

A second simulation-based study finds that carbon leakage is alleviated further under linkage than non-linkage scenarios in which each country implements independent ETSs.[106] A simulation running from 2011 to 2030 concludes that if China, Japan, and Korea implement independent ETSs without linkage,

the average carbon leakage percentage—calculated by dividing the total amount of emissions reduction in Northeast Asia into the total amount of carbon leakage in non-regulated countries—is 2.9 percent and 4.8 percent under 100 percent free allocation and auctioning scenarios, respectively. Alternatively, when the systems in the three countries are linked, the leakage effect decreases in both scenarios to 1.9 percent and 3 percent, respectively. Moreover, since the production process in China is more energy intensive, linkage could help prevent the flight of industry from Korea and Japan to China.[107]

Modeling to simulate the economic impacts of ETSs by sector and under different linkage scenarios concludes that economic losses in terms of production and trade are lowest when both Korea and China link their respective carbon markets with those of developed countries, including Japan. This result suggests that global carbon market connections that include China and developed countries would have the least adverse impact on the production and trade competitiveness of Korean industries.[108] A further government study confirms competitive distortions emerging from carbon leakage could be avoided by linking the KETS with other carbon markets, which would in turn encourage more widely disseminated low-carbon technologies.[109]

Restricted market links hold promise for Korea's regional engagement by offering a degree of partial, conditional, or restricted unit recognition among different jurisdictions.[110] The most common such constraint is to establish quantity limits on how many foreign credits are accepted in a domestic market. This can be attractive as it gives policy makers a degree of control over the workings of their domestic market that they may lose with greater connectivity. There is precedence for such restrictions, most notably through the EU ETS limiting the use of credits from the CDM and more recently through quota limits on foreign credits in the linked markets of California and Quebec. For Korea, this could entail relatively simple restrictions on the number of foreign credits accepted domestically that are tied to its NDC commitment to reduce 11.3 percent of its emissions through international market mechanisms.

Complementary policies that restrict the extent of market links would be required for Korea to capitalize on the benefits of linkage while avoiding its pitfalls.

For such connections to take hold, however, Korea must foster a more predictable regulatory environment. Political and regulatory uncertainty prevents affected firms from making long-term investments in climate mitigation. Korean firms have expressed their reluctance to actively participate in the carbon market due to frequent market interventions by the government, difficulties in making market projections, and the transferring of ETS authority from Ministry of Environment (MOE) to the Ministry of Strategy and Finance.[111] In the most recent instance of such regulatory vacillation, in mid-July 2017 the regulatory authority of the ETS was transferred back to the MOE, with government efforts to transition the ETS portfolio between the ministries ongoing.[112]

Such lack of clarity on carbon pricing and climate policy uncertainties is a key barrier to investment in clean energy and GHG abatement technologies. Linking Korea's domestic carbon market with other systems could erode these barriers by reinforcing the government's commitment to emissions reduction. Linkage arrangements and commitments made to partnering jurisdictions make it less likely that the

government will abandon or make wholesale changes to the ETS.[113] From the perspective of affected firms, market linkage can enhance the regulatory stability that influences the firm's mitigation strategy and trading decisions.

4.4 WIDESPREAD BENEFITS

As Korea is typically a net purchaser in linked scenarios, carbon market connections could increase its dependence on lower abatement costs from abroad and in doing so erode any impetus for change at home. But if ETS linkage is managed judiciously and selectively, these concerns can be addressed while reducing costs and regulatory uncertainty within Korea's wider climate strategy. When linkage is supported by other climate policies that signal long-term commitment to low-carbon growth, it creates an environment in which green investments can flourish throughout linked jurisdictions. This scenario is consistent with President Moon's position that climate policies will create new jobs and growth opportunities.[114]

Such lack of clarity on carbon pricing and climate policy uncertainties is a key barrier to investment in clean energy and GHG abatement technologies.

Linkage could also help address the transnational air pollution that has been at the center of Northeast Asia's environmental agenda since Korea, China, and Japan convened a ministerial-level trilateral dialogue on environmental cooperation in 1999.[115] Research from 2013 suggests that some 40 percent of annual fine particles of atmospheric aerosol or particulate matter 2.5 ($PM_{2.5}$) in Tokyo originates from China.[116] Meanwhile, the Korean Ministry of Environment disclosed that 30 to 50 percent of $PM_{2.5}$ originates from external sources.[117] Carbon market cooperation is a potential tool for addressing this pervasive challenge. While linked markets can erode local co-benefits if international credits are purchased at the expense of lowering pollution at home, in Korea's case linking markets is likely to have the inverse effect of supporting regional pollution reductions that in turn reduce the transboundary pollution that impacts it.

Finally, carbon market linkage provides a near-term opportunity to solidify Korea's international climate leadership, and there is a foundation from which to build. Korea has cooperated with the EU on its market design and broached linkage prospects with the EU, China, and New Zealand. China expressed positive views on linking—particularly with Korea—and the latest dialogue between the two nations reaffirmed this potential linkage partnership.[118] In concert, Korea, China, and Japan have the capacity to remake the carbon pricing landscape through cooperation and targeted links, and in doing so advance Northeast Asia's reputational and material position in international climate mitigation forums.[119] For Korea, such efforts can feed into the ultimate goal of meeting its national mitigation target in a cost-efficient manner while fostering the transition to a low-carbon economy. Market connectivity in Northeast Asia is a tool for reaching this goal that could have related economic, political, and environmental benefits. Since it is a formative time for the evolution of carbon pricing regionally and internationally, these cooperative efforts should be accelerated.

5. PATHWAYS TO NEAR-TERM CARBON MARKET COOPERATION IN NORTHEAST ASIA

CHINA, JAPAN, AND KOREA HAVE DIFFERENT ECONOMIC AND ENERGY CONTEXTS, different past and present approaches to carbon market design and operations, and different levels of enthusiasm for regional linkage possibilities in Northeast Asia. Yet these differences reveal the very complementarities that make regional market cooperation and select linkage symbiotically advantageous. China's soon-to-launch national scheme will have the scale to eschew linkage, but linking would allow China to drive foreign purchases of its emissions-reduction credits, improve its MRV and operational effectiveness to meet additional standards and develop new investment sources for its expansive economic and energy transition goals. Japan is running short of evident, affordable, rapidly deployable domestic emissions-reduction options. Targeted links would increase its access to cheaper reduction options than it has at home and would be more efficient and impactful than its current emphasis on international offsets. Korea is committed to using international market connections to meet its climate change targets, and as with Japan, the Chinese market offers an ideal source for finding relatively cheap abatement options. For each country, as the resulting mitigation costs go down, levels of climate ambition can go up.

For the region as a whole, effective linkage could reduce price volatility and erode the oversized influence of large players by expanding the size of the market. It could reduce regional carbon leakage and competitiveness concerns and reflect the economic connections that define much of Asia.[120] Linkage could reduce barriers to promoting technology transfers between jurisdictions and help participants systematically transition to cleaner energy and production systems. It could help Northeast Asian countries coalesce around rules for carbon trading and leverage a more coherent regional position to influence global rulemaking. It could build a foundation for cooperation from which other agendas could build.

The 2018–2020 period will shape the longer-term landscape of carbon pricing in Northeast Asia. Korea and China will progressively deepen their domestic ETSs and seek to optimize their functionality through experimentation and capacity building. Japan will review its domestic and international pricing efforts and likely be influenced by the progress in neighboring countries. These countries need to collaborate now to build a foundation for more extensive carbon market cooperation in the future.

1. Cultivate transparency around MRV rules and practices. Regional MRV systems need to be partially harmonized and clearly spelled out so that each jurisdiction can develop confidence that the credits being allocated by linked partners have a sound economic and environmental basis. It will take time to foster this MRV confidence on multilateral levels, and lines of communication and openness are vital. MRV cooperation could provide a basis for clarity and partial harmonization around trade rules for banking and borrowing, recognized trading products, and noncompliance penalties. Finding common ground in these areas speaks to how linked systems will be governed and operated, which is essential for gaining the efficiency benefits of market cooperation.[121]

2. Move carbon market cooperation up the agenda of the China-Japan-Korea Trilateral Summit. In 2010, Northeast Asia established the Trilateral Cooperation Secretariat to promote peace and common prosperity in the region. The Secretariat's cooperation mechanisms include the trilateral summit and address 28 topics within the category of politics and security, economy, sustainable development, and society and culture.[122] The countries also adopted the Tripartite Joint Action Plan on Environmental Cooperation (2010–2014) and extended the efforts by adopting a new Joint Action Plan (2015–2019). The new Joint Action Plan addresses nine priority areas, including strengthening cooperation in climate change through knowledge exchange, and underscored the significance of reducing GHG emissions through market mechanisms.[123] The annual trilateral summit offers opportunities for high-level political dialogue on carbon market cooperation, champions of which should work with partners at relevant ministries and beyond to encourage a focus on carbon pricing at future summits.

3. Build the quantitative evidence base. Regional scholarly collaboration is needed to develop and deploy quantitative models that offer pragmatic economic and environmental assessments of linkage impacts, including modeling the marginal abatement cost reductions, mitigation values, and cross-boundary revenue flows of linking regional markets, and presentation of these findings to policy-making communities in ways that can help inform their decision making.

4. Encourage regional collaboration to influence the implementation of Article 6 of the Paris Agreement. Articles 6.2 and 6.4 of the Paris Agreement are the most important international statutes for the operation and reporting of market measures to meet a respective country's climate change commitments. These statutes will be further defined during the 2017–2019 period, and Northeast Asian countries could have a greater impact on their implementation through finding common negotiating positions and pursuing them at international climate change forums.

5. Facilitate real-time market linkage simulations on trading platforms. The development of emissions trading systems outside of Asia has benefited markedly from simulated trading exercises on actual exchanges using hypothetical emissions credits. Similar progress could be made on Northeast Asia market linkage through such experimentation, which can be facilitated with no material risk by champions of carbon market cooperation.

6. Pilot linked subnational markets across Northeast Asia. Linking markets in Northeast Asia requires progressive experimentation. Piloting subnational connections in the region across a limited number of sectors for an initial test period would lower barriers for entry into regional market links and provide a test-bed for regional carbon market connectivity. Regional cities, capital regions, provinces, and prefectures should enter discussions to elaborate and pilot subnational linkages. Given the scale of emitting activities within these jurisdictions, such links would also have economic, environmental, and strategic benefits.

7. Agree upon a prospective date at which to begin official discussion on the launch of select market linkages. It is essential to have a temporal goal for the beginning of official policy dialogue on regional market linkage while the foundation for these negotiations is being built. While they currently support Track II diplomacy and technical dialogue, regional governments have resisted any suggestion of official dialogue or negotiations. Government leaders should come to aspirational agreement, without binding commitment, on when to begin official talks.

6. CONCLUSION

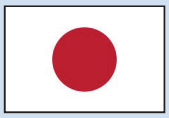
EVIDENCE FROM PAST LINKAGE EFFORTS DEMONSTRATES that while geographic proximity and close economic ties play a crucial role in building a relationship toward linkage, these factors do not guarantee successful market integration: integrating carbon markets requires a series of preliminary steps and pilot initiatives to be successful. The EU-Norway linkage was considered from the initial phases of the Norwegian carbon market development, while California and Quebec invested several years in cooperating on and then negotiating linkage.[124] Regardless of the type of and parties to linked carbon markets, linkage is less complicated and easier to achieve when design elements and political considerations are discussed during the initial phases of carbon market development.[125] Because Northeast Asia is in the formative phase of carbon market construction, the countries have an opportunity to synergize some design elements in the near term and begin working through economic and geopolitical challenges that accompany market cooperation.[126]

The key at this juncture is to create linkage-ready markets and a clear work plan for pursuing cooperation. Regional carbon markets will not become homogenous, share all design characteristics, or have a completely unified emissions cap or carbon price in the foreseeable future—or perhaps ever. The natural endowments, economic and political systems, and related climate change policies of these countries will continue to vary widely. These differences do not mean that their carbon markets cannot or should not be linked. Targeted, mutually beneficial links require harmonizing some aspects of domestic markets and designing the avenues of commonality needed to enable trading emissions allowances across different jurisdictions.

The key at this juncture is to create linkage-ready markets and a clear work plan for pursuing cooperation.

The most vital measures for addressing global climate change are to help large, developing nations industrialize without runaway greenhouse gas (GHG) emissions, and to bring the capital and capacities of wealthier countries and firms to bear effectively. Emissions-trading systems in Northeast Asia can do both. But forging carbon market links will take time and requires technical expertise, strategic vision, and diplomatic energy to cultivate the levels of trust, political will, and institutional capacity needed to link markets across national boundaries. It is time for this work to accelerate.

APPENDIX A. TIMELINE FOR THE CARBON MARKET DEVELOPMENTS IN NORTHEAST ASIA

Carbon pricing timeline	 CHINA	 JAPAN	 KOREA
2005 and before		• Enacts the Act on the Promotion of Global Warming Countermeasures in 1998 • Ratifies Kyoto Protocol in 2002 • Launches Japan Voluntary ETS (JVETS) in 2005	• Enacts the Energy Use Rationalization Act in 1979 • Introduces the Energy Target Management System and Voluntary Agreement on Energy Conservation and GHG Emissions Reduction in 1998 • Introduces KVER in 2005
2006	• National assessment report on climate change published	• Sets Kyoto emissions target of 6% reduction from 1990 emissions level by 2012 • Tokyo Metropolitan Government announces GHG emission reduction target of 25% by 2020 relative to 2000 levels	
2007	• NDRC reveals the national climate change program	• Metropolitan Environment Security Ordinance amended to officially establish the Tokyo Cap-and-Trade Program	
2008	• NDRC publishes the first version of the annual policies and actions on climate change	• Launches the Japan Verified Emissions Reduction (J-VER)	• Declares "Low Carbon, Green Growth" as the national development paradigm
2009	• State Council announces a carbon intensity reduction target of 40–45% by 2020 compared to 2005 levels		• Pledges to reduce GHG emissions 30% below BAU level by 2020 as part of the 2009 Copenhagen Accord
2010	• 12th Five-year plan (2011–2015) requires the development of ETS in China	• Tokyo ETS begins – first compliance period (FY2010–FY2014)	• Enacts the Framework Act on Low Carbon Green Growth
2011	• NDRC designates carbon emissions-trading pilots on the regional level (7 regional pilots)	• JVETS final phase ends • Saitama ETS launches	
2012		• Japan's national ETS proposal rejected • Japan imposes a nationwide carbon tax	• Enacts the Act on Allocation and Trading of Greenhouse Gas Emissions Allowances • Launches the GHG Target Management System (TMS) from 2012–2015

Carbon pricing timeline	CHINA	JAPAN	KOREA
2013	• Beijing, Guangdong, Shanghai, Shenzen, Tianjin ETSs launch	• Japan launches the Joint Crediting Mechanism and J-Credit System	
2014	• Chongqing and Hubei ETSs launch • NDRC announces national ETS will launch in 2016 • NDRC releases China's National Plan for Climate Change for 2014–2020 • NDRC releases the provisional measures for the administration of carbon emission rights trading		• Reveals the Master Plan for the Emissions Trading Scheme and Phase I National Allowances Allocation Plan
2015	• NDRC announces the launch of the national registry for voluntary emission trading • Sets NDC target to peak CO_2 emissions by 2030 and lower carbon intensity by 60–65% below 2005 levels	• Sets NDC target of 26% reduction by FY2030 compared to FY2013 • Tokyo ETS enters second compliance period (FY2015 – FY2019)	• Korea ETS (KETS) launches Phase I (2015–2017) • Sets NDC reduction target of 37% by 2030 below BAU levels
2016	• Fujian pilot ETS launches		• KETS authority transferred to the Ministry of Strategy of Finance (MOSF) from Ministry of Environment (MOE)
2017	• Announces national ETS will launch end of the year • Announces limiting of national ETS to power sector • NDRC selects China Hubei Emission Exchange and Shanghai Environment Energy Exchange as ETS registration system and trading platform, respectively	• Japan announces that it will reexamine its national carbon pricing strategy	• MOSF implements market stabilization measures – includes decision to accelerate the introduction of international market mechanisms (IMMs) from 2021 to 2018 • Phase II National Allowances Allocation Plan delayed to end of year to ensure smooth transition of KETS authority back to MOE from MOSF

Source: Created by ASPI from publicly available information: Institute for Global Environmental Studies, Environmental Defense Fund, and International Emissions Trading Association, "Japan: Market-Based Climate Policy CaseStudy," August 2016, www.ieta.org/resources/2016%20Case %20Studies/Japan_Case_Study_2016.pdf. Stefano De Clara et al., "Republic of Korea." Jeff Swartz, "China: An Emissions Trading Case Study," International Emissions Trading Association, September 2016, www.ieta.org/resources/2016%20Case%20Studies/China%20case%20study.pdf

APPENDIX B. CHINA REGIONAL PILOT ETS

	Beijing	Chongqing	Fujian	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin
General Information								
Implementation Year	2013	2014	2016	2013	2014	2013	2013	2013
Emissions intensity reduction target[127]	20.5%	19.5%	19.5%	20.5%	19.5%	20.5%	20.5%	20.5%
Regulated GHGs	CO_2	CO_2, CH4, N_2O, HFCs, PFCs, SF6	CO_2	CO_2	CO_2	CO_2	CO_2	CO_2
Cap (2016)	46 $MtCO_2e$	100 $MtCO_2e$	200 $MtCO_2e$	422 $MtCO_2e$	253 $MtCO_2e$	155 $MtCO_2e$	31.45 $MtCO_2e$	160–170 $MtCO_2e$
Price[128]	\$7.59/ $MtCO_2e$	\$0.23/ $MtCO_2e$	\$5.31/ $MtCO_2e$	\$1.93/ $MtCO_2e$	\$1.83/ $MtCO_2e$	\$4.69/ $MtCO_2e$	\$5.50/ $MtCO_2e$	\$1.27/ $MtCO_2e$

	Beijing	Chongqing	Fujian	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin
ETS Size								
Emissions covered	45%	40%	60%	60%	35%	57%	40%	55%
Sectors covered	Electricity, heating, cement, petrochemical and other industries, large public buildings	Electricity, metallurgy, chemical industries, cement, iron and steel	Industry, power and aviation	Electricity, cement, iron and steel, petrochemical industries, public services including hotels, restaurants, and business-es	Electricity, heating, metallurgy, iron and steel, automobile and equipment, chemical and petrochemical industries, cement, medicine and pharmacy, food and beverage, papermaking	Electricity, iron and steel, petrochemical and chemical industries, metallurgy, building materials, papermaking, textile, aviation, airports and ports, public and office buildings, railway stations	Electricity, building, manufactur-ing, water supply	Electricity, heating, iron and steel, chemical and petrochemical industries, oil and gas exploration
Compliance entities	947, Beijing; 26, Inner Mongolia; 6, Hebei	230	277	280 (excluding white cement)	236	368	824	109
Thresholds	+5,000 $MtCO_2e$ per year	+20,000 $MtCO_2e$ per year	Energy consumption 10,000 tons of coal equivalent (tce)/year for any year between 2013 and 2015	+20,000 $MtCO_2e$ or energy consumption 10,000 tce/year	Annual energy consumption more than 10,000 tce in any year between 2013 and 2015 for the power, steel, nonfer-rous, chemicals, petrochemicals, building materials and pulp and paper sectors, and 60,000 tce for other sectors	+20,000 $MtCO_2e$ per year for power and industry sector; +10,000 $MtCO_2e$/year for aviation and ports; +100,000 $MtCO_2e$/year for shipping; +10,000 $MtCO_2e$ /year for buildings sector	+3,000 $MtCO_2e$ /year for enterpris-es; +20,000m^2 for public buildings and +10,000m^2 for govern-ment build-ings	+20,000 $MtCO_2e$ per year

	Beijing	Chongqing	Fujian	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin
Allowance Allocation								
Allocation	Free allocation	Free allocation	Free allocation	Free allocation + auctioning (2.04% in 2014; 0.51% in 2015)	Free allocation	Free allocation	Free allocation	Free allocation
Benchmarking	New entrants	Grand-fathering only	Power, cement, aluminum, plate glass	Electricity, cement, iron and steel	Grand-fathering only	Electricity, aviation, airports, ports	Electricity, heating, water supply, manufacturing	Electricity, heating
Flexibility Mechanism								
Banking and borrowing	Banking allowed; borrowing not allowed	Banking allowed; borrowing not allowed	Banking allowed; borrowing not allowed	Banking allowed; borrowing not allowed	Banking only for units traded at least once; borrowing not allowed.	Banking allowed; borrowing not allowed	Banking allowed; borrowing not allowed	Banking allowed; borrowing not allowed
Offsets and credits	CCER + energy conservation and forestry offsets up to 5% of allowance	CCER up to 8% of compliance obligation	CCER up to 5% of compliance obligation	CCER up to 10% of compliance obligation	CCER up to 10% of compliance obligation	CCER up to 1% of compliance obligation	CCER up to 10% of compliance obligation	CCER up to 10% of compliance obligation

	Beijing	Chongqing	Fujian	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin
Non-compliance Enforcement								
Financial penalty	3–5 times average market price over past 6 months for each missing allowance	None	1–3 times average market price over past 12 months with maximum limit of 30,000 CNY	50,000 CNY	1–3 times average market price with maximum limit of 150,000 CNY	50,000 – 100,000 CNY	3 times average market price over past 6 months	None
Others	N/A	Disqualified from energy saving and climate subsidies for 3 years; reflected in SOE performance appraisal	Twice the amount of missing allowances withdrawn from next year's allocation	Deducted twice the amount of allowances from next year's allocation	Deducted twice the amount of allowances from next year's allocation	Withheld from government support for energy saving and climate subsidies; reflected in business credit report	Missing allowances can be withdrawn from the account of the company or deducted from next year's allocation	Disqualified for preferential financial support and policies for 3 years
Market Stabilization								
Price management by relevant authority	Market intervention when weighted average price is over 150 CNY for 10 consecutive days; Price is below CNY 20	Market intervention when market fluctuation occurs; compliance entities cannot sell more than 50% of their free allocation	Market intervention when market fluctuations, severe imbalances between supply and demand, or liquidity issues occur	Imposes auction price floor	Market intervention when market fluctuations, severe imbalances between supply and demand or liquidity issues emerge; 8% of the total cap kept as government reserve	Market intervention when prices vary more than 10% in one day	Market intervention when market fluctuations occurs – can sell extra allowances and only buy back up to 10% of total allocation	Market intervention when market fluctuations occurs

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