Asia Society POLICY INSTITUTE

REPORT

Carbon Market Cooperation in Northeast Asia: Assessing Challenges and Overcoming Barriers

Edited by Dr. Jackson Ewing

Carbon Market Cooperation in Northeast Asia: Assessing Challenges and Overcoming Barriers

JUNE 2018

AN ASIA SOCIETY POLICY INSTITUTE REPORT

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

ABOUT THE EDITOR

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

The Asia Society Policy Institute
Web: AsiaSociety.org/Policy-Institute
Facebook and Twitter: @AsiaPolicy
Email: policyinstitute@asiasociety.org

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

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

ABOUT THE AUTHORS (In order of appearance in report)

JEFF SWARTZ is Director of Climate Policy and Carbon Markets at the South Pole Group, where he directs strategy and services on international climate policy and carbon markets. He provides business development for the company's activities with the public sector and supervises its portfolio of public sector advisory projects. Prior to joining South Pole, he was the Managing Director of the International Emissions Trading Association (IETA). He represented IETA and its more than 140 members on all aspects of international climate change negotiations with a special emphasis on carbon pricing and its role in the 2015 Paris climate agreement. He also set up IETA's Business Partnership for Market Readiness, which shapes the next generation of carbon markets alongside the World Bank's Partnership for Market Readiness. He also spent more than four years in Beijing working on the UN Clean Development Mechanism for the Nordic Environment Finance Corporation and Evolution Markets. He has experience working for the U.S. State Department in Guangzhou, and for the Association of Monterey Bay Area Governments where he worked on the design of local implementations of California's AB 32 scoping plan.

MICHAEL MEHLING is Deputy Director of the Center for Energy and Environmental Policy Research at the Massachusetts Institute of Technology and Professor of Law at the University of Strathclyde. Previously, he was Founding President of the Ecologic Institute in Washington, D.C., and held research and teaching appointments at Georgetown University and the Universities of Greifswald, Helsinki, and Constance. In these roles, he has coordinated research and provided policy advice for government agencies, corporations, and civil society organizations in North America, Europe, and the developing world. Michael is Editor-in-Chief of the quarterly Carbon & Climate Law Review, Associate Researcher with the Energy Policy Research Group at the University of Cambridge, and a member of the Board of Directors of both the International Union for Conservation of Nature–United States and the Ecologic Institute in Berlin and Washington, D.C.

ROBERT C. STOWE is Executive Director of the Harvard Environmental Economics Program and Co-Director of the Harvard Project on Climate Agreements—both University-wide programs based in the Harvard Kennedy School (HKS). He is also an adjunct lecturer of public policy at HKS, teaching a course on international climate change policy and advising students on this set of topics. He has been engaged through the Harvard Project in the annual Conferences of the Parties of the U.N. Framework Convention on Climate Change since 2007. He was a contributing author to a chapter on international cooperation in the Intergovernmental Panel on Climate Change's Fifth Assessment Report. He has also worked in the nonprofit, academic, and business sectors, including as Vice President of Programs of the Citizens Network for Foreign Affairs, which provides assistance in agriculture and agribusiness to developing countries, and as a consultant for the World Bank and other organizations. He holds a B.A. in physics from Harvard College and a Ph.D. in political science from the Massachusetts Institute of Technology.

KIRBY LEDVINA is a research assistant with the Massachusetts Institute of Technology (MIT) Joint Program on the Science and Policy of Global Change. Her work focuses on the representation of agriculture within applied general equilibrium models, as well as climate policy modeling and analysis. She completed undergraduate degrees at MIT in management science and economics.

NIVEN WINCHESTER is Principal Research Scientist at the Massachusetts Institute of Technology (MIT). His research focuses on climate, energy, and trade policies using applied general equilibrium analysis. He has published extensively in leading peer-reviewed academic journals, including *The American Economic Review*, *The Energy Journal*, *Energy Economics, and Environmental Science and Technology*. He has advised several organizations on trade and energy issues, including the Organisation for Economic Co-operation and Development (OECD), the Federal Aviation Administration, and the New Zealand Ministry of Foreign Affairs and Trade. He is the founding co-editor of the *Journal of Global Economic Analysis*, and was named a Global Trade Analysis Project Research Fellow for the periods 2013–2016 and 2017–2020 for his contributions to the applied general equilibrium community. He also has an interest in sports economics and his research on sports ranking systems inspired a change to how major rugby competitions award league points. Prior to joining MIT, He held a faculty position at the University of Otago. He holds a Ph.D. from the University of Nottingham.

BARAN DODA is Research Officer at the Grantham Research Institute on Climate Change and the Environment at the London School of Economics. His academic research views the causes and consequences of climate change externality through the lens of macroeconomics with the aim of designing effective policy responses. His recent work has focused on the applied theoretical analysis of linking carbon markets bilaterally and multilaterally. He completed his undergraduate and graduate training in Canada and holds a B.A. degree from Simon Fraser University, and M.A. and Ph.D. degrees in economics from the University of Toronto. Previously, he taught at universities in Canada and the United Kingdom, and worked as an economist at the International Department of the Bank of Canada.

SUH-YONG CHUNG is a professor in the Division of International Studies at Korea University. He was a visiting professor at SciencesPo in Paris from 2014–2015. He directs the Center for Climate and Sustainable Development Law and Policy and the Center for Climate Change and Marine Governance at Korea University. He has published numerous journal articles and monographs in the fields of climate change, environment, and sustainable development. At the policy level, he is a member of the Policy Advisory Board of the Republic of Korea's Ministry of Foreign Affairs, Chair of the Regional Working Group on Governance of the UN Development Programme and the Global Environment Facility's Yellow Sea Large Marine Ecosystem project, and Director of the Institute of UN Affairs of UN Association-Korea. Previously, he served as a member of the Expert Committee of the Republic of Korea's Presidential Advisory Council on Science, member of the Council of Global Green Growth Institute, member of the Honorary Committee to host the Green Climate Fund, and as Vice Chair of the Compliance Committee of the UN Basel Convention. He holds degrees in law and international relations from Seoul National University, the London School of Economics and Stanford University.

XI LIANG is a senior lecturer in energy finance and Co-Director of Research at the Centre for Business and Climate Change at the University of Edinburgh's School of Business. He is Secretary General and Co-Founder of the UK-China (Guangdong) Carbon Capture, Utilization, and Storage Centre and an expert panel member in the Chinese government's climate finance policy research. He also led the UK Foreign and Commonwealth Office's EU-Guangdong ETS Linkage project and the World Bank's Network Carbon Market (China) project. He is also International Lead of the Asian Development Bank's Carbon Capture and Storage (CCS) Centre of Excellence (Guangdong) project. He currently heads projects that were awarded grants worth GBP 2.15 million, and leads the GBP 20 million Haifeng Carbon Capture pilot project. He has rich experience in asset management and investment advisory, and is also a chartered financial analyst holder and a financial risk manager. He holds degrees in electrical and electronic engineering, management research and process technology, and a Ph.D. in energy policy and finance.

SVEN RUDOLPH is an associate professor of contemporary economics in English at Kyoto University, Japan. His expertise is in sustainability economics and the new political economy of market-based environmental policy instruments. His current research focuses on subnational carbon pricing and its implications for politico-economic theory, as well as on social justice in carbon markets. Besides being a passionate university teacher, he has published extensively and presented at international venues on respective subjects. International collaboration projects in research and teaching have brought him to North America, Europe, Asia, and Australia. He also has work experience as an environmental NGO campaigner and policy advisor for the German government. He holds master's and doctorate degrees in economics from Kassel University, Germany.

TOSHI ARIMURA is a professor of political science and economics and Director of the Research Institute for Environmental Economics and Management at Waseda University in Tokyo. Prior to joining Waseda, he was a professor and Director of the Center for Environment and Trade Research at Sophia University in Tokyo. As a recipient of the Abe Fellowship, he was a visiting scholar with George Mason University and Resources for the Future from 2006 to 2008. His research focuses on climate change and energy policies, particularly regulations for air pollution, voluntary environmental actions, and innovation in environmental technology. He is the co-author of *An Evaluation of Japanese Environmental Regulation: A Quantitative Approach from Environmental Economics* (Springer 2015), and his recent research project examined the economic impact of carbon pricing on the Japanese economy. He has also served on a number of Japanese government committees on environmental issues. He holds a B.A. in history of science from the University of Tokyo, an M.Sc. in environmental sciences from the University of Tsukuba, and a Ph.D. in economics from the University of Minnesota.

STEFANO DE CLARA is Director of International Policy at the International Emissions Trading Association (IETA). He joined IETA in 2014, initially focusing on the European Union emissions trading system and UNFCCC negotiations. While continuing to work in these two areas, he also currently leads IETA's international work, including activities at the UNFCCC level and in emerging carbon markets. Working on IETA's Business Partnership for Market Readiness initiative, he often focuses on carbon markets in Asia. Prior to joining IETA, he focused on emissions trading in academia and for consulting companies. He holds a M.Sc. in Sustainable Development from Utrecht University and a B.Sc. in Environmental Science from the University of Trieste.

This page is intentionally left blank

Contents

Figures and Tables

Abbreviations

AAU	Assigned Amount Units
AGE	Applied General Equilibrium
ASSET	Advanced Technologies Promotion Subsidy Scheme with Emission Reduction Targets
BAU	Business as Usual
CCER	Chinese Certified Emission Reductions
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DPJ	Democratic Party of Japan
DRC	Development and Reform Commission
EC	European Commission
ECCC	Energy and Climate Change Committee
EITE	Energy-Intensive Trade-Exposed
EPPA	Emissions Prediction and Policy Analysis
ERC	Emissions Reduction Credit
ETS	Emissions Trading System
EU	European Union
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GHG	Global Greenhouse Gas
ICAP	International Carbon Action Partnership
IEA	International Energy Agency
IETA	International Emissions Trading Association
ITMO	Internationally Transferred Mitigation Outcomes
JCM	Joint Crediting Mechanism
JGWT	Japanese Global Warming Tax
JI	Joint Implementation
JVETS	Japan Voluntary Emission Trading Scheme
KAU	Korean Allowance Unit
KEPCO	Kansai Electric Power Company
KETS	Korean Emissions Trading System
LDP	Liberal Democratic Party
LTS	Linking Technical Standards
MAC	Marginal Abatement Cost

METI	Ministry of the Economy, Industry, and Trade
MOE	Ministry of Environment
MOSF	Ministry of Strategy and Finance
MOU	Memorandum of Understanding
MPG	Modalities, Procedures, and Guidelines
MRV	Measurement, Reporting and Verification
$MtCO_2e$	Metric Tons of Carbon Dioxide Equivalent
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
OECD	Organization for Economic Co-operation and Development
PMR	Partnership for Market Readiness
RGGI	Regional Greenhouse Gas Initiative
SBSTA	Subsidiary Body for Scientific and Technological Advice
tCO_2	Tons of Carbon Dioxide
TEMM	Tripartite Environment Ministers Meeting Among Japan, China, and Korea
TMG ETS	Tokyo Metropolitan Government Emissions Trading Scheme
TMR	Tokyo Metropolitan Region
TPS	Tradeable Performance Standards
UNFCCC	United Nations Framework Convention on Climate Change
WCI	Western Climate Initiative

Foreword

ACROSS ALL ERAS AND IN ALL PLACES, POLICYMAKERS MAKE DECISIONS on incomplete information. It is fundamental to public leadership—particularly at the highest levels—that decisions taken reflect some personal judgment of the existing evidence and arguments at hand. Uncertainty of outcome and the risk of unintended consequences are ever-present.

This reality leads effective public leaders to have a voracious thirst for information. Complex issues require balanced and nuanced understanding, with solutions based on a thorough vetting of potential impacts from a range of disciplines and practitioner expertise. This is especially true for environmental policymaking, where we face some of the gravest challenges of our time.

Climate change is no longer a future problem to prepare for; it is here. As global temperatures continue to rise and climate impacts come into confronting focus, it is clear that the world's largest emitters must commence high-impact responses now rather than later. For projects such as carbon market development and linkage, which will take years to execute and continue to mature for decades, such responses begin with gathering evidence and driving problem-solving dialogue.

Since 2015 my colleagues and I have led such an effort through the Asia Society Policy Institute (ASPI) initiative "Toward a Northeast Asia Carbon Market." The initiative has regularly brought together experts and practitioners to develop and assess regional pathways to partially linking markets in China, Japan, and the Republic of Korea. These countries, responsible for roughly one-third of global emissions, each pursue unique and expanding strategies to price carbon and curtail its devastating impacts. We are working to help them do so in concert.

This volume grows a pillar of our work that seeks to extend and deepen the evidence base for carbon market linkage in Northeast Asia. Questions abound about the barriers and benefits of regional linkage, how it might take hold, and what can be learned from experiences elsewhere. Through a series of international and regional dialogues with experts and practitioners, we have distilled the following series of topics that seek to address these questions, attracted contributions from leading global minds, and presented our findings in the chapters to come.

The volume's editor, ASPI and Duke University's Jackson Ewing, frames the work through an introductory chapter that lays bare the challenges and opportunities of market linkage in Northeast Asia. Jeff Swartz of South Pole Group extends this analysis by outlining specific pathways that could yield regional carbon market links and in fact have in other contexts. MIT's Michael Mehling offers legal perspectives on carbon market cooperation, which is complemented by Harvard University's Robert Stowe in his piece on international carbon market cooperation mechanisms. The volume makes a quantitative contribution through the work of Kirby Ledvina and Niven Winchester, also of MIT, who demonstrate the value of equilibrium modeling for regional linkage questions, and in doing so imply a new potential work-stream. Baran Doda of the LSE elucidates market linkage barriers with a productive eye toward overcoming them. Suh-Yong Chung of Korea University provides a Korean challenge to think beyond traditional linkage pathways toward innovative alternative options that could be pursued immediately. Xi Liang of Edinburgh University presents China's position on the importance of "linkage readiness" as a path toward future opportunities, which dovetails with Kyoto University's Sven Rudolph's piece on ways for Japan to engage with regional neighbors. Toshi Arimura of Waseda University extends this analysis through directly addressing connectivity issues between Japan and China. Stefano De Clara of the International Emissions Trading Association concludes the volume with business sector perspectives on regional carbon market linkage, which are roundly supportive.

I wish to thank our authors and their institutions for these contributions, and for their work across the wider lifespan of this project. Many others have also helped us conceive of this volume, with special thanks going to our partners at the World Bank Carbon Pricing Leadership Coalition and Networked Carbon Markets Initiative, CDP, Carbon Market Watch, the International Carbon Action Partnership, and KPMG. I also wish to thank the MacArthur Foundation for their support.

We concluded our 2017 report, *Northeast Asia and the Next Generation of Carbon Market Cooperation*, with the words "…forging carbon market links will take time, and require 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."

We offer this volume as an accelerant, and we will work to ensure that its findings help policymakers reduce uncertainties, clarify solutions, and enhance regional efforts toward carbon market linkage. As President of ASPI, I am confident that our work and that of our partners can help usher in a new generation of cooperative climate leadership from Northeast Asia. It is imperative that we do so.

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

1. Introduction: Incentives and Impediments to Carbon Market Cooperation in Northeast Asia

JACKSON EWING

CHINA, JAPAN, AND THE REPUBLIC OF KOREA ARE EMERGING AS MAJOR PLAYERS in the global carbon trading landscape.[1] China is moving from piloting multiyear subnational emissions trading systems (ETSs) to a national scheme launched provisionally in December 2017. The Republic of Korea (hereafter Korea) already operates the first national ETS in Asia, which moved into Phase II in 2018 and will begin to price allowances and open up further to international market connections. Japan continues to operate linked ETSs in Tokyo and Saitama Prefecture along with a voluntary national scheme and a unique international offset program.

With the three Northeast Asian countries already connected through deep economic ties and shared environmental challenges, calls for them to link their respective markets are becoming louder and more regular.[2] Linking could have economic, environmental, and strategic benefits.[3] Economically, linking could reduce the costs of emissions reductions by creating options for purchasing credits that are cheaper than those available at home. Links could also increase the number of buyers and sellers in ways that increase market liquidity and reduce carbon price volatility by expanding market scope and lessening the influence of powerful individual players. Environmentally, links could cut carbon price differentials across the region in ways that minimize the movement of emitting activities from one jurisdiction to another (leakage) and in some cases promote cleaner local environments through reducing conventional pollution (a co-benefit). Most importantly, lower emissions reduction costs could enable more ambitious climate change goals. Strategically, linking Northeast Asian markets could provide confidence-building measures for wider regional relationships and create a more level playing field for countries already inextricably connected by trade and geopolitical challenges and opportunities. It could also demonstrate global climate change leadership in Northeast Asia by signaling a commitment to long-term multilateral actions that are impactful and nuanced, and in doing so increase the impact of China, Japan, and Korea in international fora.

However, regional linkage remains a difficult prospect. China, Japan, and Korea are focused on designing and operating effective domestic carbon markets. While creating the opportunities outlined above, linkage also adds layers of technical and diplomatic complexity that will take time and political will to reconcile.[4] Each system has unique characteristics that reflect its domestic contexts, and the role that each country sees its ETS playing.

NORTHEAST ASIA'S VARIED CARBON MARKET LANDSCAPE

China seeks future development alongside cleaner environments, narrower income disparities, and a greater emphasis on high-value segments of the global economy.[5] It is launching a national ETS not just to address climate change but also as a tool to help usher in this new era. 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. As such, it exists within a complicated and often overlapping environmental policy space marked by existing and proposed policies for energy efficiency, air pollution, and renewable energy.6 These policy tools, which include a newly launched tradeable 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. There are also myriad questions about interministerial and city–provincial–central government coordination. China's environmental governance overhaul of March 2018, which created the new Ministry of Ecology and Environment from which its ETS will now be run, is designed in part to address these ambiguities. But they will not be resolved overnight, and China's new ministerial structure will undergo growing pains in tandem with its ETS.7

China's national ETS builds from subnational pilot systems, and its development has been marked by uncertainty, delay, and dwindling near-term ambition. Initially slated for 2017, only months prior to its planned rollout, 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 the power generation, aluminum, cement, and aviation sectors, with China ultimately likely opting for a power sector–only ETS in response to lingering uncertainties and industry concerns. The national system may have no compliance obligations for the first two years, making it a soft launch geared more toward getting market rules and operations in place than to having a discernable climate change impact. Most challengingly for regional linkage, China's ETS is based on tradeable performance standards (TPSs) rather than absolute caps. TPS trade calls on government administrators to determine maximum emission intensity relative to the output of a given firm. Firms with emission rates below the standard earn tradable credits, while those that exceed the standard must purchase allowances to cover the excess. The TPS approach has the advantage of adapting to economic changes, but it also creates questions about linking to other schemes that are based on unmoving emissions limits.[8]

Japan seeks to meet its climate change goals during a lingering period of energy uncertainty. The 2011 Fukushima nuclear disaster continues to loom over Japanese energy decisions, with scant public confidence in the safety of Japan's nuclear sector—which had supplied 30 percent of Japan's electricity production—and calls to phase out nuclear energy entirely. While that may or may not ultimately happen (some use of nuclear energy currently remains in Japan's future energy plans), it is unlikely that use of nuclear energy will reach pre-Fukushima levels in the foreseeable future, and virtually certain that it will not expand to the levels previously foreseen (some 60 percent of Japan's energy mix by 2100). With Japan facing natural and self-inflicted regulatory barriers to renewable energy expansion, it is replacing the lost nuclear capacity largely with fossil fuels. Given Japan's high development status, and the fact that it is already a global energy efficiency leader, it has few cost-effective domestic options for lowering emissions in-line with its climate change commitments—to say nothing of the more ambitious commitments it will be called on to make in the future.[9]

This scenario incentivizes establishing international market links that offer Japan cheaper emissions options than it currently has available, but there are structural impediments to this path. Japan has no national ETS, instead operating a subnational scheme with linked markets in Tokyo and Saitama Prefecture; a voluntary national system used by companies for reporting and corporate social responsibility purposes (J-Credit); and an international offset program called the Joint Crediting Mechanism (JCM), in which Japan invests in emissions reductions in developing countries in exchange for part of the credits that these projects yield. While the country has nearly two decades of experience with domestic emissions trading, it has no current plans to legislate or regulate toward a mandatory national system. This creates parity challenges for its ability to link with markets in China and Korea and may encourage Japan to simply double down on its JCM efforts at the expense of more impactful—but also more complicated—regional links in Northeast Asia.

For market linkage in Northeast Asia to be possible, targeted research needs to help policymakers consider the core questions they face.

Korea meanwhile has rapidly transitioned from a poor postwar state in the early 1950s to a major industrial player by the 1970s to a modern, digitized economy in the 21st century. This change brought pronounced environmental challenges alongside it, which Korea is attempting to address with command-and-control regulations and its nascent national carbon market.[10] The market—the Korean ETS (KETS)—is the first national system in Asia and at this writing is moving from the first to the second of a three-phase process that runs to 2025.

Since the KETS launched in 2015, it has been plagued by a lack of liquidity and the sense among major firms that it offers few pathways for significantly driving down abatement costs. In 2017, the Ministry of Strategy and Finance (MOSF) implemented market stabilization measures to address supply-demand imbalances, restrict excessive banking credits, increase borrowing provisions, and bring forward the introduction of international market mechanisms from 2021 to 2018. Still, the characteristics of the Korean economy—particularly its dependence on energy-intensive industries and high volume of fossil fuel imports[11]—are making market-driven domestic emissions reductions difficult. These difficulties are amplified by regulatory uncertainty, which creates questions about the future of KETS operations while eroding confidence in the staying power of green investment incentives. In a telling vacillation, the KETS has been transferred from the Ministry of Environment (MOE) to the MOSF and recently back to the MOE since its implementation. Such wavering makes it difficult to secure the confidence of domestic stakeholders, and even more so prospective regional partners.

EXTENDING THE EVIDENCE BASE NOW

The differences and challenges detailed in the previous paragraphs mean that deep national-level market links are years away from taking hold in Northeast Asia, with such links emerging during the early 2020s offering the earliest plausible time line. This does not mean that technical and track II diplomatic work on these issues should be delayed. For market linkage in Northeast Asia to be possible, targeted research needs to help policymakers consider the core questions they face. Lead times for building the linkage foundation in other contexts show the value of early action. The Norwegian market was conceived in the early 2000s, launched in 2005, and linked with the EU in 2008. Linkage was considered and worked toward from its early days of formulation, not just after its 2005 launch. California and Québec likewise studied and adopted many of the same market design principles and held frequent technical discussions during the years of their development to ensure a degree of harmonization across targeted rules and designs. This allowed them to link the markets just one year after launching operations.

The Northeast Asian context is different from these other linkage experiences, but process lessons on consultation, dialogue, and applied research efforts still pertain. Building from multiple closed-door technical and policy dialogues, public panels, private consultations, and desk research, this volume extends the research foundation for carbon market linkage efforts in China, Korea, and Japan. It takes this work in multiple directions.

Chapters two through four explore key linkage building blocks—both broadly and specifically for Northeast Asia. In chapter two, Jeff Swartz elaborates on the essential building blocks for regional carbon market cooperation and linkage. Upon offering a brief but comprehensive juxtaposition of the differences among the Northeast Asian countries of China, Korea, and Japan, Swartz still argues unyieldingly that linkage could pay significant dividends for industry while offering opportunities for governments. Anticipating the multiple approaches advocated for elsewhere in the volume, Swartz claims that a range of linkage and cooperative options warrant consideration—from bilateral and plurilateral linkages to carbon market clubs—as each can help polities increase their emissions reduction ambitions while lessening competitiveness and carbon leakage concerns. In chapter three, Michael Mehling reminds the reader of the importance of rules and institutions during the pursuit and later execution of linkage policies. He argues that having proper legal and institutional frameworks in place, both domestically and internationally, is essential to enjoying the potential value of linkage and avoiding the pitfalls of mismatched ambition and structural convolution. Vitally, Mehling does not argue for a one-sized framework but rather presents different levels of legal formalization along a linkage continuum. Finally, while multiple authors delve into issues surrounding Article 6 of the Paris Agreement, Robert Stowe takes it head on in chapter four. He presents a new analysis on how different approaches to cap-setting in Northeast Asian countries will impact their respective abilities to utilize Article 6's internationally transferred mitigation outcomes (ITMOs); despite the challenges, he notes that the Paris Agreement is predicated in many ways on iteration, future learning, and malleable policy evolutions. It therefore offers opportunities for Northeast Asia that may not be fully in the current view.

Chapters five through seven tackle more directly the benefits, barriers, and processes that could define carbon market linkage in Northeast Asia. Kirby Ledvina and Niven Winchester in chapter five make the most substantive and quantitative case in the volume on the potential economic dividends accompanying linkage. They review literature on internationally traded carbon allowances to claim that applied general equilibrium (AGE) models offer insights into the marginal abatement cost (MAC) curve impacts of linked markets. While Ledvina and Winchester relate these findings to the Northeast Asian context, their piece underwrites a potential future wave of scholarship into the issues. In chapter six, Baran Doda presents an inverse analysis on the barriers to carbon market linkage in Northeast Asia and more broadly. The capstone from which arguments flow is that the costs and benefits of linkage are unevenly distributed, which is certainly true. Doda's critical contribution is the way that he applies this analysis not just to the economic and greenhouse gas implications of linked markets but also to larger issues of social impact, co-benefits, and strategic calculations. These issues are particularly germane to Northeast Asia, where carbon markets have multipart mandates, environmental and economic challenges are regionally entwined, and strategic relationships are complex and sometimes fraught. Suh-Yong Chung argues in chapter seven that conventional carbon market linkage is not the solitary path forward. Rather, market mechanisms offer a wide range of opportunities to cooperate on climate mitigation. Collaborative offset projects that include China, Korea, and Japan, and are pursued in-line with Article 6 principles, offer unique and relatively low-hanging potential.

Chapters eight to ten present further granularity on regional linkage prospects from Chinese and Japanese perspectives. In chapter eight, Xi Liang trumpets linkage readiness as the apt operative goal for China in the near term. While China has explicitly declared linkage possibilities to be years in the future and is currently fixated on domestic progress, Chinese policy makers have taken steps toward some design of harmonization with other systems and engaged in track II linkage dialogue with their regional neighbors. Liang offers a raft of recommendations too extensive to list here on how these efforts can be deepened and furthered. Sven Rudolph, in chapter nine, lays bare Japan's uphill climb toward a potential future national market, while not ruling it out, and elaborates the powerful opposition faced by Japan's carbon market advocates and policy practitioners. In the near term, Rudolph argues that the existing Tokyo ETS holds the most promise for international engagement and linkage. Toshi Arimura agrees in chapter 10, and argues most directly on a theme found throughout much of the volume—that carbon market linkage offers developed and developing economies in Northeast Asia symbiotic opportunities to reduce emissions in cost effective ways. Arimura focuses on Japan's need to further international engagement because of high costs at home, and the promise of engaging with China. Similar arguments pertain for Korea.

Stefano De Clara concludes the volume in Chapter 11 by making the business case for linked markets.[12] He melds the conceptual economic efficiency and environmental arguments for linked markets with observed benefits elsewhere and, vitally, with the publically declared preferences of business leaders around the world. Such links in Northeast Asia could help address competitiveness concerns while concurrently offering businesses cheaper emissions reduction options.

FUTURE PROSPECTS

This volume seeks to help Northeast Asian stakeholders pursue a unique and potentially high-value opportunity. 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 some such differences reveal the very complementarities that make regional market cooperation and select linkage symbiotically advantageous. Linking would allow China to drive foreign purchases of its emissions reduction credits, improve its measurement, reporting and verification (MRV) and operational effectiveness to meet additional standards, and develop new investment sources for its expansive economic and energy transition goals. Targeted links would increase Japan's access to cheaper reduction options than it has at home and be more efficient and impactful than its current domestic and international offset strategies. Korea is set to use international market connections to meet its climate change targets, and connecting with the Chinese market could help widen its currently limited abatement options.

Past linkage efforts demonstrate that while geographic proximity and close economic ties can play a crucial role in building a relationship toward linkage, these factors do not guarantee a successful market integration because integrating carbon markets requires a series of preliminary steps and pilot initiatives to be successful. Regardless of what actual steps are pursued, linkage will necessarily be less complicated and easier to achieve when design elements and political considerations are discussed during the initial phases of carbon market development. 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 2018–2020 period will be formative for 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. Continuing work is needed to build the evidence base from which they can work.

ENDNOTES

[1] This framing chapter is partially adapted from Jackson Ewing, "Building the Evidence Base for Carbon Market Linkage in Northeast Asia," Asia Society Policy Institute, December 15, 2017, https://asiasociety.org/sites/default/files/2017-12/White percent20Paper percent20- percent20Building percent20the percent20Evidence percent20Base percent20for percent20Carbon percent20Market percent20Linkage percent20in percent20Northeast percent20Asia.pdf.

[2] Jackson Ewing and Minyoung Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, https://asiasociety.org/sites/default/files/2017-12/NextGen percent20Report percent20FINAL percent20WEB.pdf; "China, Japan, Korea Carbon Market Links Resurface as Talks Set for Next Week," Carbon Pulse, December 16, 2017, http://carbon-pulse.com/44890/.

[3] Jackson Ewing, "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, http://asiasociety.org/files/RoadmapNortheastern-final-online+.pdf; Michael Mehling and Benjamin Görlach, "Multilateral Linking of Emissions Trading Systems," (working paper 2016-009, Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology, Cambridge, MA, April 2016), http://ceepr.mit.edu/files/papers/16-009.pdf.

[4] Jessica F. Green, "Don't Link Carbon Markets," *Nature* 543, no. 7646 (March 2017): 484–486, doi: 10.1038/543484a.

[5] Jackson Ewing, "China's ETS at Home and Abroad," Carbon Pricing Leadership Coalition, August 29, 2017, www.carbonpricingleadership.org/blogs/2017/8/29/chinas-ets-at-home-and-abroad.

[6] Jessica Teets, "The Power of Policy Networks in Authoritarian Regimes: Changing Environmental Policy in China," *Governance* 31, no. 1 (January 2017): 125–141, https://doi.org/10.1111/gove.12280.

[7] Jackson Ewing, "Tough Tasks for China's New Environment Ministry," *The Diplomat*, March 17, 2018, https://thediplomat.com/2018/03/tough-tasks-for-chinas-new-environment-ministry/.

[8] Lawrence Goulder and Richard Morgenstern, "China's Rate-Based Approach to Reducing CO_2 Emissions: Strengths, Limitations, and Alternatives" (presentation, Annual Meeting of the American Economic Association, Philadelphia, PA, January 5, 2018), www.aeaweb.org/conference/2018/preliminary/paper/Adat9KGT.

[9] Ewing and Shin, "Northeast Asia."

[10] Sung-Young Kim and Elizabeth Thurbon, "Developmental Environmentalism: Explaining South Korea's Ambitious Pursuit of Green Growth," *Politics & Society* 43, no. 2 (March 2015): 213–240, https://doi.org/10.1177 percent2F0032329215571287.

[11] Sagar Kafle et al., "A Review on Energy Systems and GHG Emissions Reduction Plan and Policy of the Republic of Korea: Past, Present, and Future," *Renewable and Sustainable Energy Reviews* 73 (June 2017): 1123–1130, http://dx.doi.org/10.1016/j.rser.2017.01.180.

[12] Carbon market linkage and the business sector in Northeast Asia is furthered explored in ASPI's paper. Asia Society Policy Institute, "Business Sector Action for Carbon Market Cooperation in Northeast Asia," May 2018, https://asiasociety.org/sites/default/files/2018-05/Business percent20Sector percent20Action percent20Report.pdf.

2. Building the Foundation for Regional Carbon Market Linkage in Northeast Asia

JEFF SWARTZ

SUMMARY

CHINA, KOREA, AND JAPAN NOW HAVE VARIATIONS OF A CARBON MARKET at the national or subnational level, but there are wide differences in policy design and implementation status. Linkage of carbon markets in Northeast Asia could reduce industry concerns on competitiveness and offer opportunities for governments to raise emission reduction targets. The Republic of Korea's (hereafter Korea) ETS is the most advanced, and it can share many lessons learned and experiences to policy makers and industries in both China and Japan. There are ample opportunities for increased dialogue between China, Korea, and Japan on carbon markets.

BACKGROUND

Cooperation on carbon markets through bilateral or plurilateral linkages or "carbon market clubs" can both help countries and regions increase the ambition of their emission reduction targets and address competitiveness and carbon leakage concerns. Regardless of how potential connections emerge in Northeast Asia, China's participation will be absolutely critical to addressing climate change as it is the region's largest emitter, economy, and carbon market.

Linkage of carbon markets in Northeast Asia could reduce industry concerns on competitiveness and offer opportunities for governments to raise emission reduction targets.

With the launch of China's national emissions trading system (ETS) in December 2017, carbon markets are now operational in all major economies of Northeast Asia. Korea, the first country in Northeast Asia to introduce an economy-wide ETS, will start the second phase of its ETS in 2018, and Japan has subnational ETSs in place in the city of Tokyo and in Saitama Prefecture and voluntary markets driven by private sector actors. China's national ETS will first begin with a pilot phase for companies in the power sector until 2020 when an initial trading phase will commence. It is anticipated that other major emitting sectors of the economy, such as cement, iron, steel, and petrochemicals, will be gradually added into the ETS over time.

Despite the fact that these three major economies now have a price on carbon to reduce emissions, the design of each ETS is particularly distinct. That should not come as a surprise, since each of these policies was created and implemented by policy makers to reduce the specific emissions in their respective countries. Carbon emissions are a transboundary issue that can only meaningfully be reduced at a scale through regional or international climate policies.

This year, 2018, marks the starting point for these three countries to come together to look at constructive ways to cooperate on carbon pricing so that emissions can be reduced at a greater scale and competitiveness concerns can diminish. This chapter will identify and explore concrete suggestions for China, Japan, and Korea to cooperate on carbon pricing, with the ultimate goal of a linked emissions-trading system with a mutual pool of carbon allowances that can be easily exchanged across these three distinct systems.

The chapter will explore the following key question: *What are the most constructive steps to take between 2018 and 2020 to build the foundation for regional market linkage?* The first section will discuss the current status of emissions-trading systems in China, Japan, and Korea and identify the gaps in implementation for each of these three systems. The section compares the implementation and time lines of each ETS as well as its cap coverage, current price levels, accounting framework, and offset framework. These topics were chosen because they represent a cross section of the essential elements in any ETS. Section two includes a comparative analysis of the policy design for each system by exploring policy similarities and differences and identifying several areas for potential policy cooperation. The third section of the chapter focuses on opportunities for international cooperation, going into detail on several concrete suggestions for linkage.

Carbon emissions, are a transboundary transboundary issue that can only meaningfully be reduced at a scale through regional or international climate policies.

POLICY MAPPING ACROSS CHINA, KOREA, AND JAPAN

This section of the paper focuses on policy mapping. In order to understand the key concrete steps for regional carbon market linkage, this section summarizes policy information for each ETS.

China's National ETS

Building upon the seven regional ETS pilots created in 2013, China formally "launched" its national ETS on December 19, 2017. The launch took place more than two years after President Xi Jinping announced during his visit to the White House in September 2015 that China would have a nationwide ETS, a development that was widely anticipated by both the Chinese and the international climate change community.

Implementation Status and Timeline

China's ETS, in its current form, has been substantially scaled back in terms of its scope and ambition compared to draft versions that were released by China's National Development and Reform Commission (NDRC) in 2016.[1] For example, the only sector to be included during this first "trial" stage of the national ETS is the power sector, whereas the NDRC's draft plans anticipated that eight sectors of the economy would be included at the start of the ETS. The first, trial stage of the national ETS is expected to last until 2020 and will serve as a market simulation, meaning that power sector companies will have no formal compliance obligations and face no penalties for noncompliance during this phase of the ETS.[2] It is unclear how long the trial period will last, and when and if other industrial sectors will be gradually phased into the ETS.

As of May 2018, no power sector company in China has yet to receive its initial allocation of emissions allowances. The national ETS registry, to be managed by the climate change authorities in the newly formed Ministry of Ecology and Environment (which is taking over these duties from the NDRC), has also yet to be finalized, and power sector companies have had limited interactions with the registry interface to date.

Coverage

The national ETS is expected to cover any stationary power source that consumes more than 10,000 tons of coal equivalent per year.[3] There are no geographic restrictions on where these stationary sources could be located; therefore, the ETS is in effect a national system that covers all provincial power emissions. Provincial power grids vary widely in China: heavily industrialized northeast China has a coal-heavy grid, while the southern provinces generally have a more diverse energy mix with natural gas and nuclear having an increasingly greater share.

Accounting Framework

China's measurement, reporting, and verification (MRV) system has largely been set up based on the design of MRV rules in the European Union ETS (EU ETS). The EU-China ETS Project, an EU-funded technical cooperation agreement with China, has included several modules on MRV since its inception in 2015,[4] which have influenced the design of China's MRV system for the ETS. However, one critical difference with the EU ETS in China's ETS is the inclusion of indirect emissions in addition to direct emissions.[5] Policy makers in China's ETS are intent on preventing carbon leakage by including indirect emissions, but the result is that the accounting framework in China will be unique among other ETSs by having to include these emissions sources. Another unique feature of the Chinese market is its focus on energy efficiency targets rather than hard caps, which from an accounting perspective means that both emissions and production output must be measured in concert.[6]

Partially in response to this need, and with support from the World Bank's Partnership for Market Readiness (PMR), China has received World Bank funding for a continuous emissions-monitoring system (CEMS). This system allows China to monitor emissions included in ETS sectors in real time as well as measuring the carbon content (in calorific value) of inputs and outputs to products manufactured by installations included in the ETS. As of May 2018, power sector installations in the national ETS have already submitted verification reports for year 2017 emissions and will do so again for year 2018 emissions in order for the NDRC to allocate allowances. The design of the MRV systems in the seven ETS pilots differ slightly from the national ETS MRV system but are largely based on the same principles.

Carbon Price Levels

Unintentionally, carbon prices have fluctuated widely in the seven ETS pilots since they launched in 2013. Due to a general practice of over-allocating allowances by the provincial development and reform commissions (DRCs), there has been an overall lack of liquidity and therefore carbon prices have varied widely. For example, prices started at a relatively high level when the ETS pilots launched but dropped significantly thereafter. Most ETS participants chose (and continue to choose) to hold onto their allowances for the purpose of surrendering them back to the DRCs at the end of the compliance year rather than selling or buying allowances for purely speculative or financial reasons. In the third quarter of 2017, the average price in the pilots stood at USD 3.13 per ton.[7] Since initial allowances have not yet been allocated under the national ETS, there is no indicative or reliable pricing information at the time of writing.

Flexibility mechanisms

Under the seven ETS pilots, included installations could use Chinese Certified Emission Reductions (CCERs), a domestic offset system, for meeting between 5 and 10 percent of their compliance obligation depending on the specific pilot. The draft rules for the national ETS also include provisions for allowing installations to use CCERs for meeting a portion of their compliance obligation, but the NDRC temporarily halted CCER issuances in 2017[8] and has not indicated how CCERs will be used in the current trial period of the ETS.

Korea's ETS

Korea was the first country in Northeast Asia to implement an ETS when it launched in 2015. According to the Korean Ministry of Environment (MOE), The Korea ETS (KETS) is expected to play a significant role in enabling Korea to meet its nationally determined commitment (NDC) target of reducing emissions by 37 percent below business-as-usual emissions. Since the launch of its ETS in 2015, the Korean government has struggled to win over business support for the ETS, and there has been a ministerial clash between the MOE and the Ministry of Strategy and Finance over which should have the responsibility of administering and enforcing the ETS. As of May 2018, the KETS is in its second phase, which started on January 1, 2018, and is under MOE authority.

Implementation and Timeline

Since the first phase of the KETS, which ran from January 2015 to March 2017, Korea's ETS implementation and time line have been more developed than China's in terms of policy complexity and detail. During this time, 18.7 $MtCO_2e$ was exchanged among 524 entities. The government issued 100 percent of allowances for free during this phase using historical emissions (aka grandfathering) with the exception of clinker, oil refining, and aviation, which used benchmark data to receive their allowances. During Phase II of the KETS, which will run until December 2020, the Korean government is expected to auction 3 percent of the total volume of allowances. However, auctions for 2018 have been postponed indefinitely,[9] which has undermined the ambition of the phase and prevented the government from realizing a potential source of revenues. The government is also expected to move toward establishing benchmarks for all sectors included in the KETS during the second phase. Phase III of the KETS is planned to run from January 2021 to January 2025, and at least 10 percent of allowances are planned to be distributed by auctions.

Coverage

The KETS covers any company with an installation that emits more than 125,000 tons of CO_2 per year and targets the six Kyoto greenhouse gases. As the KETS is economy wide, it covers a wide range of sectors, including domestic aviation. In total, 23 sectors and 5 subsectors are included in the KETS[10] with 67 percent of the country's emissions covered.[11] The power and steel sectors are the largest emitters and make up a more than significant share of installations covered under the KETS.

Accounting Framework

During the first phase of the KETS, the government set up MRV standards that have been designed using best practices from the EU ETS and California's carbon market. The government plans to update the MRV standards continuously as more sectors move toward benchmark-based allocation. Korea is currently exploring how product benchmarks have been set in the EU ETS and applying a similar practice for installations under the KETS. Importantly for regional cooperation prospects, Korea's overarching climate change targets call for 11.3 percent of its emissions reductions to come from internationally cooperative approaches. Whether this is met through offsets, market links, or a combination remains to be seen.

Carbon Price Levels

As 100 percent of allowances have been distributed for free to companies under the KETS, there has been little incentive to date for companies in Korea to trade allowances. As a result, there is an overall lack of liquidity in the KETS and a very low traded volume. As of May 2018, the price of allowances (KAUs) was close to or slightly above KRW 22,000 (USD 20.50) according to the Korean Exchange KRX.[12] Compared to most ETSs, Korea's has relatively high prices as there is no carbon price floor (CPF) or ceiling, and the market price is set only on the few trades that have taken place to date.

Importantly for regional cooperation prospects, Korea's overarching climate change targets call for 11.3 percent of its emissions reductions to come from internationally cooperative approaches. Whether this is met through offsets, market links, or a combination remains to be seen.

Flexibility Mechanisms

Each company under the KETS could use up to 10 percent of its total allocated allowances with offsets. During Phase I, only offsets from projects located within Korea could be used for compliance, and these offsets had to come from eligible CDM methodologies and be issued after April 2010. During Phase II, offsets from projects located outside Korea can be used only if the Korean company using them has at least a 20 percent investment in the actual project that is reducing emissions. The government is exploring how emission reductions under Article 6 of the Paris Agreement—which covers international mitigation cooperation—can be used for Phase III of the KETS.

Japan

Japan currently does not have a national carbon-pricing system in place. In 2005, Japan pioneered a domestic voluntary ETS and domestic offset system (JVETS and J-Credit). These pilots ended in 2012, and the government of Japan has not yet introduced an ETS. Since 2012, Japan has levied a USD 0.95 to USD 3.00 carbon tax on upstream petroleum and coal emissions[13] and operates mandatory ETSs in the Tokyo Metropolitan Region (TMR) and the Saitama Prefecture.

Implementation and Timeline

Japan's citywide ETS in the TMR has operated since 2010 as has the Saitama ETS, which is linked to Tokyo. Since 2013, Japan has also established the Joint Crediting Mechanism (JCM) to allow Japanese companies to provide technology transfer to other countries in return for earning the emissions reductions that will count toward Japan's NDC. The JCM—already an offset program of substantial size—is expected to issue more than 50 million tons of CO_2e by 2030.

Coverage

Japan's carbon tax covers less than 5 percent of its total emissions, whereas the TMR and Saitama ETSs have an emissions inventory that is largely made up of the building and transportation sectors. There are approximately 1,200 covered entities in the Tokyo ETS as of 2018.[14] As a result, Japan does not have a high percentage of emissions covered by its current carbon price systems.

Accounting Framework

Companies included in the Tokyo and Saitama ETSs must submit an annual emissions report that must be verified with a third-party verification agency that is registered with the Tokyo authorities. The JCM uses an MRV framework with reference-level emissions as a benchmark in the 50+ countries that have signed a JCM cooperation agreement with Japan.[15]

Carbon Price Levels

There is no publicly listed information of carbon prices in the Tokyo and Saitama ETSs; this is reputed to be because no transactions occurred during the past year of activity. As a result, liquidity is much lower than in China and Korea.

Flexibility Mechanisms

The Tokyo and Saitama ETSs allow for offsets from renewable energy and for installing energy-saving and emissions reduction activities for small and midsize entities.[16]

COMPARATIVE ANALYSIS OF CHINESE, KOREAN, AND JAPANESE ETSs

While there are identifiable areas where China, Korea, and Japan could collaborate over their differences on emissions trading, significant relevant differences exist among this trio of countries. While Korea and Japan are similar in terms of economic development and GDP levels, China's level of economic development and economic output is vastly different in terms of carbon intensity. Therefore, there are limitations as to how much policy comparability is possible for carbon markets in Northeast Asia. This section provides a summary of the expected policy developments for each ETS during the period of 2018 to 2025, with a particular focus on efforts and challenges to implementing a national ETS in Japan.

Offsets and Flexibility Provisions

A major common feature of all three ETSs is that they consider the use of offsets and endorse their utility as a flexibility provision for obligated entities. While China is the most restrictive toward the use of offsets at the time of writing, its pilot ETSs still allow for the use of offsets, and China has historically benefited greatly from the CDM offset market under the first phase of the Kyoto Protocol. Korea has also ensured that offsets are included in its ETS and offered this flexibility to Korean firms. Japan is a global leader in offsetting through the JCM. Cooperation on offsets is one policy component with relatively low barriers for collaboration that China, Korea, and Japan could explore further.

Accounting Framework

Apart from offsets, there are very few policy similarities across the three carbon markets with the exception that China and Korea have both modeled their MRV frameworks on the EU ETS. While each country has a robust MRV system in place, the framework and rules for these systems are designed differently, as the overall ETS design is different. Therefore, linkage considerations will depend on using techniques for heterogeneous policy connections.[17]

Carbon Price Levels

Moreover, Korea has the only carbon market with a regulated nationwide carbon price, although even Korea's carbon price is informed by the few carbon trades that have occurred during its first phase of operation. There was no carbon trading during the past year of the Tokyo and Saitama ETSs, and carbon trading has yet to begin in China's national ETS.

General Comparison

Korea has the most to offer in terms of experience sharing with carbon markets. Its ETS has been in force for far longer than China's national system, and the Tokyo and Saitama ETSs are not at a national level. Korea is now studying how to regulate firms under its third ETS phase, which will begin in 2021 and eventually start the process of auctioning allowance permits rather than free distribution. Korea is also the only country of the three with the intention to fully utilize the ETS as a policy tool to achieve its NDC under the Paris Agreement. Neither China nor Japan has signaled how its carbon markets will help them achieve their NDCs, and neither country has set out a vision for using carbon markets after 2020. Japan has clearly expressed its intention to use the JCM to meet its NDC, but the JCM is not a carbon market, as there is no emissions cap or trading of permits. Taking all of this into consideration, Korea could play a critical role in providing policy insight and advice to China and Japan on a wide degree of carbon market topics.

RECOMMENDATIONS FOR MOVING TOWARD LINKAGE

Despite the wide differences in carbon market design and evolution in Northeast Asia, ample opportunities still remain for cooperation on carbon markets in this subregion. With the right political environment and support in place, discussions and tangible progress on linking carbon markets between China, Korea, and Japan could take place. To lay the foundation for a tangible roadmap toward linkage, policy makers should consider the following:

1. **NDC Quantification Dialogue:** One of the most challenging aspects of the implementation of the Paris Agreement is the wide variety in how countries count their emissions reductions and track progress. Many countries with economy-wide NDCs have advocated for quantification of NDC targets as a precursor to participation in Article 6 transactions. NDC quantification would help ensure that double counting is avoided and would safeguard the environmental integrity of these reductions by having a robust inventory of emissions under the NDC in place.

   Recommendation: Hold an ongoing regional working dialogue on NDC quantification and measuring NDC progress. Regional governments could host such a dialogue in conjunction with experts and personnel from the regional United Nations Framework Convention on Climate Change (UNFCCC) office.

2. **Exploring Article 6 Interests and Alignment:** China, Korea, and Japan view the use of Article 6 to meet their current NDC in distinctive ways. China has not signaled any intention to use Article 6 at the time of this writing, whereas both Korea and Japan intend to use it to fulfill their NDC pledges. Japan intends to do so through the JCM, whereas Korea has not specified the type of Article 6–eligible units it will use to fulfill its NDC. While there are various initiatives to bring countries together to discuss and strategize how to finalize the Article 6 rulebook, no initiative currently exists for China, Korea, and Japan to discuss their views and challenges with implementing Article 6 within their respective NDCs. An Article 6 dialogue could achieve tangible results as it would allow not only for a difference of views to be exchanged but also a discussion on exploring pilot opportunities for the three (or two) countries to jointly pool resources in internationally transferrable mitigation outcomes (ITMOs) to mutually increase the ambition of their NDCs. By increasing exchanges on Article 6, indirect and informal opportunities for exploring carbon market linkage could also occur.

   Recommendation: Establish a government technical-level dialogue on the use of Article 6 within the context of each of the NDCs in China, Korea, and Japan. Such a dialogue could take place prior to the annual UNFCCC negotiations and rotate among the three countries.

3. **Tackling Industry Opposition:** Industry in Northeast Asia is largely opposed to regulations that impose a price on carbon, given the pressures of consistent economic growth and maintaining economic stability. Exploring areas for dialogue among industries on how carbon markets work in practice and how they have impacted economies in other jurisdictions (e.g., Europe, California, and New Zealand) could lead to an improved understanding of the merits of carbon pricing. An annual dialogue among representatives from similar industries across Northeast Asia, and in particular the power sector (including the power sector associations), could focus on the following topics:

   a. Internal company preparation and systems for ETS management
   b. Managing allowance allocation and ETS compliance strategies
   c. Building and sourcing an offset portfolio
   d. Best practices for third-party verification and audits
   e. Principles for linkage and global carbon pricing

   Recommendation: Facilitate an international industry exchange on overcoming obstacles to carbon markets in Northeast Asia. The goal of such a dialogue would be for industry to understand the benefits of regional ETS linkage and to support policy makers for a linked carbon market.

4. **Establish Official Cooperation:** Since 1999, the Tripartite Environment Ministers meeting among Japan, China, and Korea (TEMM) has taken place to explore and strengthen environmental cooperation in Northeast Asia.[18] While some discussion of carbon market cooperation has taken place through the TEMM, a formalized technical dialogue could be added to the agenda for policy makers from China, Korea, and Japan on offset usage, accounting frameworks, and market evolution, with the goal of identifying linkage opportunities.

Recommendation: Explore opportunities for officials from China, Korea, and Japan to meet annually to explore cooperation on carbon markets, with the TEMM as a key example.

5. **Simulation Learning:** A number of carbon market simulation tools available today are an excellent resource to learn in practical terms how carbon markets function. Organizations such as the Environmental Defense Fund and the Fundação Getulio Vargas business school have simulation tools available. These tools could be adapted and programmed to simulate a linked emissions market for Northeast Asia.

   Recommendation: Establish a linked carbon market simulation exercise for policy makers and industry participants to better understand how linked carbon markets could reduce competitiveness concerns and increase ambition.

CONCLUSION

During the past 10 years, substantial progress has been made in establishing carbon markets in Northeast Asia. Japan established subnational carbon markets in Tokyo and Saitama, China set up seven ETS pilots in several cities and provinces and a national ETS, and Korea established Asia's first economy-wide carbon market. Each of these carbon markets was set up to address national concerns over climate change and energy management and, as a result, were designed to function in a national economic context. Thus, carbon market policy design differs across Northeast Asia with a very wide gap in each implementation schedule. Korea sits geographically in the middle of this trio and is also the most advanced in terms of implementing its ETS. It has a clear mandate and intention to use its carbon market for the fulfillment of its NDC and is currently exploring ETS legislation for after 2020. It could offer vast insights to both China and Japan on carbon market implementation and policy design. In addition, many low-cost opportunities and easy-to-implement recommendations for information sharing and policy exchanges could help create the foundations for linkage of carbon markets in Northeast Asia.

ENDNOTES

[1] Stian Reklev, “China Lists National ETS Industries, Outlines Rules for Verifiers,” Carbon Pulse, January 19, 2016, http://carbon-pulse.com/14353/.

[2] International Carbon Action Partnership (ICAP), “China ETS Profile,” March 9, 2018, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems percent5B percent5D=55.

[3] ICAP, “China ETS Profile.”

[4] European Commission, “EU-China Climate Change Cooperation,” 2018, https://ec.europa.eu/clima/policies/international/cooperation/china_en.

[5] Sean Healy, Martin Cames, and Felix Matthes, “Climate Action and the Emissions Trading System (ETS) in China,” European Parliament Committee on the Environment, Public Health and Food Safety (ENVI), September 2016, www.europarl.europa.eu/RegData/etudes/BRIE/2016/595330/IPOL_BRI(2016)595330_EN.pdf.

[6] Lawrence Goulder and Richard Morgenstern, “China’s Rate-Based Approach to Reducing CO_2 Emissions: Strengths, Limitations, and Alternatives” (presentation, Annual Meeting of the American Economic Association, Philadelphia, PA, January 5, 2018), www.aeaweb.org/conference/2018/preliminary/paper/Adat9KGT.

[7] World Bank Partnership for Market Readiness (PMR), No. 10, “China Carbon Market Monitor,” Q3 2017, www.thepmr.org/system/files/documents/China percent20Market percent20Newsletter_FINAL.pdf.

[8] World Bank Partnership for Market Readiness (PMR), No. 8, “China Carbon Market Monitor,” Q1 2017, www.thepmr.org/system/files/documents/PMR percent20China percent20Market percent20Newsletter_FINAL_EN.pdf.

[9] “South Korea Hands Out 538.5m Carbon Allowances for 2018,” *Carbon Pulse*, December 19, 2017, http://carbon-pulse.com/45006/.

[10] Junwon Hyun and Hyungna Oh, “Korea’s Emission Trading System: An Attempt of Non–Annex I Party Countries to Reduce GHG Emissions Voluntarily,” March 12, 2015, www.thepmr.org/system/files/documents/KETS_HyunOh_0312p.pdf.

[11] Ecoeye, “Korea ETS,” 2018, www.ecoeye-int.com/m21.php.

[12] Korea Exchange, “ETS Daily/Closing Price,” February 2018, http://global.krx.co.kr/contents/GLB/05/0506/0506030102/GLB0506030102.jsp.

[13] International Energy Agency (IEA), “Japan’s Carbon Tax Policies and Measures,” March 4, 2015, www.iea.org/policiesandmeasures/pams/japan/name-139284-en.php.

[14] Bureau of Environment of the Tokyo Metropolitan Government, “Results of Tokyo Cap-and-Trade Program in Second Fiscal Year of Second Compliance Period,” February 21, 2018, www.kankyo.metro.tokyo.jp/en/climate/cap_and_trade/index.files/7thYearResult.pdf.

[15] Institute for Global Environmental Strategies (IGES), Environmental Defense Fund (EDF), and the International Emissions Trading Association (IETA), “Japan: Market-Based Climate Policy Case Study,” August 2016, www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/2016/Japan_Case_Study_2016.pdf.

[16] International Carbon Action Partnership (ICAP), “ETS Map of Japan—Tokyo Cap-and-Trade Program,” March 9, 2018, https://icapcarbonaction.com/en/ets-map?etsid=51.

[17] Michael Mehling, Gilbert Metcalf, and Robert Stavins, "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)," Harvard Project on Climate Agreements, September 16, 2017, https://scholar.harvard.edu/files/stavins/files/mehling-metcalf-stavins_linking_heterogeneous_climate_policies_consistent_with_the_paris_agreement.pdf.

[18] Ministry of Environment of Japan, "The Tripartite Environment Ministers Meeting Among Japan, China, and Korea (TEMM)," 2018, www.env.go.jp/earth/coop/coop/english/dialogue/temm.html.

3. Linking Carbon Markets: Legal and Institutional Issues and Lessons for Northeast Asia

MICHAEL MEHLING

SUMMARY

RULES AND INSTITUTIONS MATTER WHEN LINKING. Domestic and international laws govern the form and process of a link and also set out substantive conditions and restrictions. Once established, the operation of a link will benefit from defined procedures and institutions. Provision should be made for routine coordination as well as systemic change. Case studies of existing links, such as those between California, Ontario, and Québec and the European Union and Switzerland, highlight the importance of sustained dialogue, mutual transparency, and a commitment to shared principles. Over time, robust governance structures will prove as important to a functioning Northeast Asian carbon market as technical alignment of system design.

LINKING CARBON MARKETS: LEGAL AND INSTITUTIONAL LESSONS FOR NORTHEAST ASIA

When considering a link between carbon markets, attendant decisions will be primarily guided by environmental, economic, and political considerations, including questions such as its expected distributional effects or its impact on aggregate emissions. Implementation of the link will eventually give rise to more technical questions, for instance, on the arrangements to account for emission transfers across linked registries. What these questions have in common is that they usually allow for a range of different answers, subject to the relative merits of alternative outcomes.

Legal and institutional questions related to linking tend to yield more rigid answers, however, and will usually apply to a narrower subset of issues, such as the legal authority to link and the legal form of a link's implementation. In some cases, the law may set out binary stipulations, requiring or proscribing a specific course of action, and affording limited or no flexibility to policy makers. In other cases, legal considerations may not mandate a specific outcome but will still affect the desirability of a link. Understanding the legal implications of linkage is therefore important when evaluating alternative approaches and their respective consequences.

Generally, legal norms can be distinguished by whether they address formal questions, such as institutional powers and procedures, or questions of substance. In the context of linking, formal aspects tend to dominate the legal assessment, including issues such as the mandate to negotiate a link, the form and process of linkage, and the procedures and institutions underpinning the routine operation, as well as the termination, of the link. These questions can overlap, for instance, when the legal authority to link has implications for the form or applicable procedures. Being primarily formal in nature, they do not necessarily affect the substantive choices reflected in or shaping an actual link.

Such legal and institutional questions transcend geographies, temporal contexts, and—to an extent—differences among respective political, economic, and legal systems. They must be grappled with across any prospective linkage setting, and Northeast Asia will prove no exception. Regional linkage efforts there would benefit from coalescing around core legal considerations, and from looking to linkage experiences elsewhere for lessons and guidance.

Legal Authority

Linking emissions trading systems can facilitate the transfer of significant revenue streams across jurisdictions and will affect compliance costs under linked emissions trading systems as well as, potentially, their environmental integrity. Any decision to link should therefore be based on a solid legal mandate to avoid or minimize subsequent challenges, whether these occur through judicial channels or in the arena of political debate and public opinion. Ideally, the authority to link will thus stem from formal legislation; a link that is based purely on a political decision or administrative regulation could be seen as deficient in terms of its legitimacy, and the transparency and accountability of the preceding process.

In the European Union, for instance, the directive establishing its regional carbon market contains a mandate to explore agreements with "third countries…to provide for the mutual recognition of allowances" and goes on to specify procedural requirements as well as material and formal restrictions on the scope and partners of the link.[1] Likewise, a rule adopted by the Californian legislature allows for linkage but requires that any linking partner have "adopted program requirements for greenhouse gas reductions…that are equivalent to or stricter than those required" in California.[2] By including these provisions in formal legislation, both jurisdictions have created a robust basis for carbon market cooperation with other jurisdictions.

Form and Process

A link between carbon markets can assume various forms, with differences in degree, scope, and the direction of trading flows. Conceptually, a link can be either direct or indirect, with a direct link allowing trade both within and between different systems,[3] whereas an indirect link occurs when one system links to a second system that is, in turn, linked to a third system. Direct links are conditional on an explicit linking decision by at least one of the linked jurisdictions[4] and can be further distinguished by whether unit flows are possible in one or more directions.

A unilateral link involves a jurisdiction recognizing units from one or more foreign systems without those systems necessarily reciprocating. It can be established through a simple clause specifying the conditions for recognition and any applicable restrictions, for instance, on the type or number of units. By the same token, a unilateral link can be altered or terminated at any point in time and does not narrow the sovereignty of the jurisdiction establishing the link. It is that flexibility which explains why a majority of links currently in place are unilateral.

A bi- or multilateral link, by contrast, requires two or more jurisdictions to agree on the mutual recognition of units and allows trade to occur in all directions across systems.[5] As a result, these links will generally necessitate some form of coordination between systems to synchronize the required adjustments, ranging from the mere decision to simultaneously accept foreign units for compliance purposes to more ambitious levels of integration, such as an agreement upon the trajectory of reduction obligations in each scheme.[6]

Different instruments are available to facilitate and formalize such coordination. Jurisdictions seeking to link may opt to negotiate and formally enter a binding international treaty, which offers a transparent and predictable framework for transactions across linked trading systems, yet it is also subject to a number of legal constraints and procedural requirements. As one of the recognized sources of international law, a treaty can, as a rule, be concluded by formal subjects of international law only,[7] entailing what is often a cumbersome ratification or approval process. Likewise, withdrawal from the treaty and subsequent amendments will only be possible under the provisions for adjustment or suspension set out in the treaty.[8] An example of linking through a formal international treaty is the link between the European Union and Switzerland, presented in greater detail in the pages that follow.

Formalized legal agreements between linking parties provide the most overt and clearly defined rules and procedures and both express and protect the expectations of parties better than other linking instruments.

Coordination for a bi- or multilateral linkage can also occur by way of a political understanding on the mutual recognition of carbon units, coupled with domestic adjustments to each system. In legal terms, this alternative will be similar to the unilateral link described earlier, albeit with the difference that affected jurisdictions will establish unilateral links on a reciprocal basis. Such reciprocal links have the benefit of obviating lengthy ratification procedures and avoiding other restrictions imposed by domestic and international law, yet they still leave each linking jurisdiction with the flexibility to terminate the link or adapt it to changing circumstances as needed.

Details of the underlying political understanding can be formalized by a political agreement, such as a memorandum of understanding (MoU), and elaborated in technical guidance or standards. While these arrangements document the intent to cooperate, they lack the binding force of a treaty, entailing a residual risk of adjustments to, or even suspension of, the link by one of the participating jurisdictions, for instance, following political changes such as a domestic election. Such unforeseen disruptions can significantly impact the linked market and may even affect the broader economies of participating jurisdictions.[9] An example of multilateral linkage through a political agreement with mutual recognition of units and legal and administrative coordination is the link between California, Québec, and Ontario, which is described in greater detail in the pages that follow.

In sum, formalized legal agreements between linking parties provide the most overt and clearly defined rules and procedures and both express and protect the expectations of parties better than other linking instruments. But these agreements can also be difficult to achieve, and they will create real or perceived barriers for entry vis-à-vis future linking parties. Less formalized approaches based on MoUs can lower such barriers and prove more palatable, particularly during the early stages of linking efforts, but they will likely possess less legal and procedural clarity and less operational predictability once the linkage takes shape.

Procedures and Institutions

Once emissions trading systems are integrated through linkage, the discussion invariably shifts to considerations of ongoing governance and routine management of the link.[10] Such matters acquire particular relevance in the event of critical changes to the link; to the linked trading systems; or to the context they operate in, for instance, due to suspension or termination of the link, amendments to design features of a trading system, or unexpected economic or environmental circumstances affecting the linked market.[11] To ensure smooth operation of the link, parties may establish institutional arrangements that go beyond the link itself, ranging from ongoing procedures such as recurrent consultations and notification duties all the way to a standing entity endowed with specified administrative and rule-making functions.[12]

At an early stage of integration, cooperation tends to be more informal and occurs through loose arrangements geared toward exchange of information, promotion of uniform approaches and standards, stakeholder involvement, and outreach activities. Such cooperation will typically precede an actual link and will help establish the necessary conditions for eventual trading between systems.[13] Rather than adopt binding standards or recommendations, the resulting networks will be largely limited to issuing recommendations and providing advice on the implementation and harmonization of trading schemes.[14] As emissions trading systems converge and their linkage enjoys greater political support, however, participating jurisdictions can opt for more formal arrangements to sustain and further strengthen market integration. Where separate emissions trading systems have not yet been introduced, such cooperation can also take the form of a common design framework harmonizing key features of the emissions trading systems and specifying joint procedures and institutional arrangements to ensure readiness for linkage from the outset.

Design features that can be harmonized over time or through a common design framework include common principles and standards for scope and coverage; allowance allocation; and measurement, reporting, and verification. Joint procedures can include mutual notification and information duties; external review or reciprocal monitoring of the emissions trading systems; and periodic meetings of representatives from each system to discuss items for harmonization, such as cost containment mechanisms. Harmonization can also extend to technical aspects, such as the registry software and auctioning platform used by participating jurisdictions and may result in the creation of an institution, such as a secretariat facilitating operation of the linked market through coordination, data collection, oversight, and broader administrative functions such as registry maintenance.

At a more advanced stage of integration, participating jurisdictions may opt for the establishment of a more formal institution with independent legal personality, a constitutive mandate, and defined governance structures. Such an organization could be afforded genuine powers to elaborate and enforce market rules in pursuit of its mandate, for instance, to facilitate market integration and convergence, uphold environmental performance and integrity, and safeguard market efficiency and functioning. Aside from the example of the supranational European Union Emissions Trading System (EU ETS), where the European Commission (EC) has gradually acquired greater and more centralized authority as the system administrator,[15] no linkage has to date resulted in the creation of such an entity with independent regulatory and enforcement authority, although some conceptual proposals have envisioned a central institution mandated with powers akin to those presently exercised by central banks, such as strategic interventions in the supply of tradable allowances.[16]

Substantive Considerations

Aside from questions of form, process, and institutions, legal considerations can also arise with regard to the material content of the link. At a minimum, a link requires a stipulation that foreign units be recognized for compliance, a determination that will generally be made effective through an amendment of the instruments establishing each trading system. Additionally, the link may need to account for differences in the type and definition of tradable units, impose quantitative or qualitative restrictions on foreign units (such as aggregate import limits), or apply any other adjustments—for instance, a discount or exchange rate—to reflect differences in their mitigation value.[17] In the case of bi- or multilateral linking, the treaty or informal arrangement between parties to the link may specify the rights and duties of each party, including procedures and penalties for any arising disputes.

Because each link emerges into an existing landscape of legal norms, moreover, it will invariably interact with different areas of material law. Areas of law that can have a bearing on the link range from high-level constitutional precepts—such as basic rights, general principles, and institutional mandates—to more specific issue areas—such as contract law, tort law, property law, taxation and accounting rules, financial services regulation, and criminal law.[18] Over time, the sustained viability and political acceptance of a trading link will depend on its ability to secure consistency of these written and unwritten norms, principles, and material provisions. Otherwise, it not only risks being annulled through a judicial challenge but also may undermine the validity of any transactions carried out under the link and, in the longer term, the legitimacy and acceptance of the link itself. Generalizations are difficult when assessing the relevance of substantive law to linkage, as that will necessarily depend on the particularities of the specific context.[19]

Adding further complexity to this question are the multiple sources of law and levels of governance that can set out relevant material law. Mostly, the areas of law cited in the preceding paragraph will originate in national law, which will generally have effect only within the jurisdiction in which it was adopted.[20] Indirectly, such rules may nonetheless affect entities in other linked jurisdictions, for instance, when the favorable status afforded to market participants in one jurisdiction results in "forum shopping"[21] or alters the distribution of units across jurisdictions. Material provisions governing both the form and substance of a link may also be found in supra- or international law, as exemplified by the mandate set out in the directive establishing the EU ETS, or the operational provisions to engage in voluntary cooperation under Article 6.2 of the Paris Agreement (see chapter four of this volume) that are currently being elaborated and will apply between all parties to the Agreement.

CASE STUDIES AND LESSONS LEARNED

California-Ontario-Québec Linking Agreement

On October 1, 2013, California and Québec entered an arrangement to link their respective trading systems by January 1, 2014.[22] Ontario subsequently joined this arrangement, which was revised to reflect evolving circumstances, on September 22, 2017.[23] Despite being designated an "agreement," the linking arrangement was not legally binding, given the federate states' and provinces' lack of power to conclude formal treaties under public international law. All three jurisdictions expressly acknowledged this in the preamble when they stated, "the present Agreement does not, will not and cannot be interpreted to restrict, limit or otherwise prevail over each Party's sovereign right and authority to adopt, maintain, modify or repeal any of their respective program regulations."

As the second iteration of the instrument coordinating one of the most successful links between emissions trading systems in different jurisdictions, the agreement between California, Ontario, and Québec offers valuable insights into the material and procedural provisions of a link. It is structured in five chapters, titled “General Provisions,” “Harmonization and Integration Process,” “Operation of the Agreement,” “Miscellaneous Provisions,” and “Final Provisions.” Central to the establishment of the link is the commitment to “provide for the equivalence and interchangeability of compliance instruments issued by the Parties for the purpose of compliance with their respective cap-and-trade programs” and “permit the transfer and exchange of compliance instruments between entities registered with the Parties’ respective cap-and-trade programs using a common secure registry” (Article 1 [b] and [d]), an objective that is operationalized by the “mutual recognition of the Parties’ compliance instruments” (Article 6). Regulatory harmonization is defined as one of the primary objectives of the linking arrangement (Articles 1 [a] and 4), and implementation of the foregoing commitments and other provisions is acknowledged in the preamble to require domestic regulatory adjustments by each party. Differences between trading systems and any design changes are addressed through consultations and cooperative efforts at harmonization between both parties (Article 3). Parties also undertake to cooperate in the application of these harmonized rules, for instance, in the area of market supervision and enforcement (Article 11).

A further tenet in the linking arrangement between California, Ontario, and Québec is the agreement to “develop and implement an accounting mechanism” that provides for transparency and to promote “the sharing of information to support effective administration and enforcement” of each trading system (Article 1 [c] and [g]). In terms of institutional structures, the linking arrangement specifies that parties “shall continue coordinating administrative and technical support through the WCI, Inc.,” a nonprofit corporation established in 2011 to provide administrative and technical support to participants in the Western Climate Initiative. Among its functions is the administration of a joint registry and joint auctions. Additionally, the agreement establishes a Consultation Committee composed of one representative from each party, a role assigned ex officio to specific offices in each jurisdiction, who meet “as needed to ensure timely and effective consultation in support of the objectives of this Agreement” (Article 13).[24]

EU-Switzerland Linking Agreement

Following several years of—at times strained—negotiations, the EU and Switzerland agreed on criteria and arrangements for linking their emissions trading systems. On November 23, 2017, both jurisdictions signed an agreement establishing the link,[25] which is set to enter into force in the year following exchange of the instruments of ratification or approval, with the actual link thus expected to be operational from January 1, 2019 or 2020 (preamble). Unlike the arrangement between California, Ontario, and Québec described in the preceding section, the agreement between the EU and Switzerland has been adopted in the form of a binding international treaty, as required under the linking mandate set out in the legal basis of the EU ETS.[26] It is divided into nine chapters, titled “General Provisions,” “Technical Provisions,” “Aviation,” “Sensitive Information and Security,” “Development of Legislation,” “Joint Committee,” “Dispute Settlement,” “Suspension and Termination,” and “Final Provisions.” Several annexes provide further design criteria, technical standards on linking, and detailed guidance on sensitive information.

Chapter I declares both emissions trading systems linked (Article 1) but makes the link conditional on each system meeting the essential criteria set out in the annexes regarding scope and coverage, registries, and auctions and auctioning platforms (Article 2). Chapter II on technical aspects stipulates the mutual recognition and fungibility of allowances that operationalize the link and also sets out accounting provisions, including periodic transfer of Assigned Amount Units (AAUs) to ensure consistency under the Kyoto Protocol (Article 4).[27] Rather than create one shared registry, the agreement provides for a direct connection between the registries in each trading system, the European Union Transaction Log (EUTL) and the Swiss Supplementary Transaction Log (SSTL), and stipulates conditions under which one or both parties may temporarily close the registry link (Article 3). Parties also commit to elaborating Linking Technical Standards (LTS), which will set out in much greater detail the technical specifications of the registry link (Annex II).[28]

A separate chapter is dedicated to the protection of sensitive information against unauthorized disclosure or integrity loss (Articles 8 and 9), with several annexes specifying the security requirements, the sensitivity levels, and relevant handling instructions (Annexes II, III, and IV). Several provisions set out notification and coordination obligations with regard to legislative and other activities that may affect the link (Articles 10 and 11), and either party can request a meeting of a Joint Committee composed of representatives of each party (Article 12). Its functions are to administer the agreement and ensure its proper implementation, adopt new or amending existing annexes, discuss amendments to the agreement, facilitate the exchange of views on domestic measures that may affect the link as well as suspension or termination of the agreement, settle disputes, and conduct periodic reviews of the link to ensure that, inter alia, the link does not undermine emissions reductions targets or the integrity and orderly functioning of each carbon market. Finally, the agreement also lists the conditions under which a party may suspend the link (Article 15) as well as the procedure for termination (Article 16), and it makes provision for unilateral or joint linkage with third parties (Article 18).

RECOMMENDATIONS FOR NORTHEAST ASIA

Based on the foregoing conceptual analysis and case studies, a number of recommendations can be formulated for the legal and institutional architecture of a future Northeast Asian carbon market based on linked emissions trading systems. First, parties to such a link should ensure their regulatory framework specifies a mandate for linkage, setting out the required legal authority, attendant procedure, and—if applicable—any minimum conditions for linkage. An explicit mandate not only helps support the robustness of an eventual link but also sends a clear signal about the political willingness to cooperate on carbon trading and increases transparency about procedural and substantive requirements for linking in the respective jurisdiction. Where linking occurs on a mutual basis, especially where it is implemented through a formal arrangement such as an international treaty, parties have to take care to specify the rules, modalities, and procedures applicable to the link, addressing operational issues, such as notification and consultation provisions to ensure coordination of the link, as well as more systemic issues, such as amendments, suspension, or termination of the link.

Perhaps the most important condition of a successful link, therefore, remains a mutual commitment to acting in good faith, striving for transparency and fairness, and favoring a culture of long-term cooperation over short-term self-interest.

Another important condition for the sustained acceptance of a linking arrangement can be expressed in procedural terms during the process of establishment, but also in its subsequent operation. At all stages of its elaboration, a linking arrangement should seek to ensure transparency; provisions on linking should be clearly worded and precise, the processes leading to their adoption clearly described, and the institutions they create governed by a defined mandate. Involvement by affected stakeholders and the public when designing the link can further help improve acceptance and confidence in the market. Once the linking arrangement enters into force, disputes and irregularities may nonetheless arise across the link, necessitating a mechanism to settle disputes but also raising the question of accountability, with regard to both market participants and supervising institutions. A linking arrangement should therefore consider not only routine operation of the link but also unexpected circumstances and situations.

Both case studies surveyed in greater detail here—the link between California, Ontario, and Québec and the link between the EU and Switzerland—have opted to spell out all these aspects, and more, in the arrangements they put in place between themselves to create the carbon trading link. Still, not all eventualities can be anticipated and set out beforehand in a linking instrument. Perhaps the most important condition of a successful link, therefore, remains a mutual commitment to acting in good faith, striving for transparency and fairness, and favoring a culture of long-term cooperation over short-term self-interest.

ENDNOTES

[1] Linking to jurisdictions other than those with quantitative targets under the Kyoto Protocol is only possible, for instance, if these have "compatible mandatory greenhouse gas r systems with absolute emissions caps"; see Art. 25 (1a) of Directive 2003/87/EC of October 13, 2003, establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and amending Council Directive 96/61/EC, OJ 2003 L275/32, as amended.

[2] See California Senate Bill 1018, Public Resources, § 12894 (f) (1) and (3) (2011–2012).

[3] Jane Ellis and Dennis Tirpak, *Linking GHG Emission Trading Schemes and Markets* (Paris: OECD, 2006), 8.

[4] Judson Jaffe and Robert N. Stavins, *Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges* (Geneva: International Emissions Trading Association, 2007), 11.

[5] Michael Mehling and Erik Haites, "Mechanisms for Linking Emissions Trading Schemes," Climate Policy 9, no. 2 (2009): 169, at 181.

[6] Jaffe and Stavins, *Linking Tradable Permit Systems*, 51.

[7] Anthony Aust, *Modern Treaty Law and Practice*, 3rd ed. (Cambridge: Cambridge University Press, 2014), 55.

[8] Erik Haites and Xueman Wang, "Ensuring the Environmental Effectiveness of Linked Emissions Trading Schemes Over Time," *Mitigation and Adaptation Strategies to Global Change* 14 (2009): 465, at 474; William A. Pizer and Andrew J. Yates, "Terminating Links between Emission Trading Programs," *Journal of Environmental Economics and Management* 71 (2015): 142.

[9] Mary J. Mace et al., *Analysis of Legal and Organisational Issues Arising in Linking the EU Emissions Trading Scheme to Other Existing and Emerging Emissions Trading Schemes* (Brussels: European Commission, 2008); Pizer et al., "Terminating Links."

[10] Benjamin Görlach, Michael Mehling, and Ennid Roberts, *Designing Institutions, Structures and Mechanisms to Facilitate the Linking Emissions Trading Scheme* (Berlin: German Emissions Trading Authority (DEHSt) at the German Environment Agency, 2015).

[11] Haites et al., "Ensuring the Environmental Effectiveness"; Mace et al., *Analysis of Legal and Organisational Issues*; Pizer et al., "Terminating Links."

[12] Andreas Tuerk, Michael Mehling, Christian Flachsland, and Wolfgang Sterk, "Linking Carbon Markets: Concepts, Case Studies and Pathways," *Climate Policy* 9 (2009): 341.

[13] Dallas Burtraw, Karen Palmer, Clayton Munnings, Paige Weber, and Matt Woerman, *Linking by Degrees: Incremental Alignment of Cap-and-Trade Markets* (Washington, DC: Resources for the Future, 2013).

[14] An example for such cooperation is the International Carbon Action Partnership (ICAP) launched on October 29, 2007, by more than 15 national and regional governments, expressly aimed at creating a "forum to discuss relevant questions on the design, compatibility and potential linkage of regional carbon markets"; see ICAP, "ICAP Political Declaration," October 2007, https://icapcarbonaction.com/en/?option=com_attach&task=download&id=153.

[15] Among the functions exercised by the European Commission are allocating emissions and regulating the auctioning process; defining rules on measurement, reporting, and verification; managing price extremes in the market through a Market Stability Reserve (MSR); and regulating market participants, including compliance entities and financial intermediaries such as brokers and exchanges.

[16] For a conceptual proposal that includes elements of such centralized governances, see the work on Networked Carbon Markets (NCM) advanced by the World Bank Task Force to Catalyze Climate Action. World Bank Task Force to Catalyze Climate Action, *Globally Networked Carbon Markets* (Washington, DC: International Bank for Reconstruction and Development, 2013).

[17] Lambert Schneider, Michael Lazarus, Carrie Lee, and Harro van Asselt, "Restricted Linking of Emissions Trading Systems: Options, Benefits, and Challenges," *International Environmental Agreements: Politics, Law and Economics* 17 (2017): 883.

[18] Karoliina Anttonen, Michael A. Mehling, and Karl Upston-Hooper, "Breathing Life into the Carbon Market: Legal Frameworks of Emissions Trading in Europe," *European Environmental Law Review* 16, no. 4 (2007): 96–115.

[19] For some case studies, see Michael A. Mehling, "Legal Frameworks for Linking National Emissions Trading Systems," in *The Oxford Handbook of International Climate Change Law*, eds. Cinnamon P. Carlarne, Kevin R. Gray, and Richard Tarasofsky (Oxford: Oxford University Press, 2016): 261–288; Michael A. Mehling, "Linking of Emission Trading Schemes," in *Legal Aspects of Carbon Trading: Kyoto, Copenhagen, and Beyond*, eds. David Freestone and Charlotte Streck (Oxford: Oxford University Press, 2009): 108–133.

[20] This follows from the doctrine of territorial sovereignty, which affirms that a nation-state exercises the supreme, and normally exclusive, authority within its territory; see Robert Jennings and Arthur Watts, *Oppenheim's International Law*, Volume I: *Peace*, 9th edn. (London: Longman, 1992), 564; Ian Brownlie, *Principles of Public International Law*, 7th edn. (Oxford: Oxford University Press, 2008), 299.

[21] Regina Betz and Ashley Stafford, "The Policy Issues Arising with the Linking of International Emissions Trading Schemes," *Australian Resources and Energy Law Journal* 27, no. 1 (2008): 86-104.

[22] Agreement between the California Air Resources Board and the Gouvernement du Québec concerning the harmonization and integration of cap-and-trade programs for reducing greenhouse gas emissions, September 27, 2013, www.arb.ca.gov/cc/capandtrade/linkage/ca_quebec_linking_agreement_english.pdf.

[23] Agreement on the Harmonization and Integration of Cap-and-Trade Programs for Reducing Greenhouse Gas Emissions, entered between California, Ontario, and Québec on September 22, 2017, www.arb.ca.gov/cc/capandtrade/linkage/2017_linkage_agreement_ca-qc-on.pdf.

[24] Specifically, the Consultation Committee is mandated with monitoring the implementation of all harmonization and integration efforts for the trading systems and greenhouse gas emissions reporting rules, making related recommendations, and—as a catchall clause—addressing any other issues raised by the parties.

[25] Agreement between the European Union and the Swiss Confederation on the linking of their greenhouse gas systems, *Official Journal* L 322 (December 7, 2017), 3–26, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:22017A1207(01).

[26] Article 25 (1) of Directive 2003/87/EC refers to the procedure set out in Article 218 of the Treaty on the Functioning of the European Union (TFEU), which applies to international agreements between the EU and third countries or international organizations.

[27] This exemplifies the necessary provision for future corresponding adjustments under Article 6(2) of the Paris Agreement, something that is acknowledged in the preamble of the linking agreement between the EU and Switzerland: "Welcoming the Agreement reached at the 21st Conference of the Parties to the UNFCCC in Paris on 12 December 2015, and recognizing that the accounting issues resulting from that Agreement will be looked at in due course."

[28] Such LTS shall, for instance, specify the architecture of the communication link, the security of data transfer, the list of functions, the definition of the web services, the data-logging requirements, the operational arrangements, the communication activation plan, the testing procedure, and the security-testing procedure.

4. The Paris Agreement's Article 6 and Cooperation in Northeast Asia to Address Climate Change

ROBERT C. STOWE[1]

CHINA, JAPAN, AND KOREA TOGETHER ACCOUNTED FOR APPROXIMATELY 28 PERCENT of global greenhouse gas (GHG) in 2014.[2] In addition, GHG emissions have been increasing significantly in the region, especially in China (which is the world's largest emitter). Therefore, in order to address global climate change effectively, it is essential that the countries of Northeast Asia implement effective climate change policies—and take full advantage of opportunities for international cooperation in reducing emissions.

National and subnational governments in Northeast Asia are indeed deploying a range of policies intended to address climate change. Policies that yield a price on carbon are important in this mix, to somewhat varying degrees across the region. China has undertaken a rolling launch of a nationwide pricing system—a set of sectoral (and perhaps sub-sectoral) tradable performance standards (Ewing 2016, 2017; Ewing and Shin 2017; Goulder 2017; Goulder and Morgenstern 2018; ICAP 2018; Karplus 2017). The Republic of Korea (hereafter Korea) launched a national emissions trading system (ETS) covering larger emitters in six sectors in January 2015. Japan has subnational ETSs in two neighboring districts, Tokyo and Saitama, and has been considering a national ETS since 2010. Japan is collaborating with countries across East Asia on its Joint Crediting Mechanism, which has the potential to support pricing systems in the region.

At the same time, negotiators representing Parties[3] to the Paris Agreement[4] are developing the modalities, procedures, and guidelines (MPGs)—or "rules and regulations"—needed to effectively implement the Paris Agreement's Article 6, which provides options for Parties to cooperate in addressing climate change (IETA 2017b, 4–6; SBSTA 2017a, 2017b).[5] Article 6.2 is particularly important, because it provides opportunities for participating Parties to apply emissions reductions from other jurisdictions to the attainment of their nationally determined contribution (NDC).[6] These extraterritorial emissions reductions may be less costly to achieve than domestic mitigation opportunities; therefore, Article 6.2 transfers have the potential to lower mitigation costs in participating countries and, in aggregate, the world. Lower costs may prompt governments to pursue more ambitious policies in subsequent rounds of NDCs, which all participants in and observers of the Paris process agree is essential, if the world is to adequately address climate change.

Cost effectiveness is also a principal benefit of well-designed pricing policies (ETSs or carbon-tax systems) at the regional, national, and subnational levels. Article 6.2 makes no reference to carbon pricing—and Parties may utilize so-called internationally transferred mitigation outcomes (ITMOs) regardless of the type of domestic climate change policies they employ. However, Article 6.2 will provide an accounting framework for collaboration across multiple national systems—and will guide and encourage further development of these systems—including in Northeast Asia. This is true, in part, because of the example that Article 6.2 sets; "trading" mitigation outcomes internationally may encourage market mechanisms domestically. It is also true because the accounting interface between domestic pricing systems (especially ETSs) and ITMOs is more transparent and user-friendly, as this paper will explain.

Article 6.2 requires that Parties transferring ITMOs carefully account for the transfer to avoid double counting of emissions reductions. This is essential if Article 6 and the Paris Agreement as a whole are to be effective in achieving their environmental goals. There are a number of challenges, however, to realizing an Article 6.2 accounting mechanism.[7] Perhaps the most important is the use of relative emissions reduction targets in many NDCs.

An *absolute* emissions reduction target is characterized as the number of tons of GHG emissions reduction—economy wide—compared to *measured* emissions in a reference year.[8] Mitigation outcomes for NDCs with absolute, economy-wide targets are already unitized—as mass-based quantities of emissions reduction. It is relatively easy, therefore, for an Article 6.2 accounting system to verify that transfers between Parties with absolute targets have avoided double counting, provided the measurement, reporting, and verification (MRV) processes for the respective Parties are sound.

Relative targets are of two major subtypes: intensity targets, denominated in tons of GHG emissions reduction per unit of GDP, and mass-based emissions reduction relative to a business-as-usual (BAU) emissions baseline. (See also Mehling et al. 2017, 20–21.) If the NDC quantitatively specifies the modeled BAU or GDP baseline—as some NDCs indeed do for BAU-type targets—along with the percentage reduction from the baseline in a target year, then the relative emissions reduction target is effectively equivalent to a quantitative (mass-based) target. (The Party must be committed to not changing this baseline over the period covered by the NDC, for this equivalency to hold.)

In practice, however, for NDCs with relative targets—including those BAU-based targets that can be quantified—economy-wide emissions actually increase for some time. Moreover, while the emissions target can be quantified in some cases, the emissions reduction is always relative to a modeled baseline, not compared to a measured amount of emissions in a previous year, as with NDCs having absolute targets.

In these respects, an emissions reduction in a BAU-based NDC that specifies the baseline is quite similar to an emissions reduction in an emissions reduction credit (ERC, or "offset") system. Historically, the largest such ERC system has been the Kyoto Protocol's Clean Development Mechanism. Existing ERC systems are all project based—or at most programmatic (including multiple projects of a similar type), though sectoral systems have been envisioned.[9] In a clean development mechanism (CDM) project, for example, actual emissions are compared with a modeled, quantitative, BAU baseline[10]—with the difference being converted to offset credits denominated in tons of GHGs.

Negotiators working on Article 6.2 MPGs will need to decide whether such unitized emissions reductions can be transferrable, as CDM (and other offset) credits have been in the past. The outcome depends on whether such transfers can satisfy the conditions of Article 6.2, namely, that transfers "promote sustainable development and ensure environmental integrity and transparency, including in governance" and avoid double counting, under a "robust" accounting regime.

Other NDCs with relative targets do *not* provide the quantitative value of the modeled BAU or GDP. It is probably impossible then to define the emissions reduction unit in the country with the relative target—

or to demonstrate that double counting has been avoided. Parties with such NDCs will probably not be able to participate in Article 6.2 transfers.[11] China, Japan, and Korea's NDCs[12] are, respectively, examples of each of these cases:

- China's NDC includes a *set* of targets, including the following:[13]
    - o A 60–65 percent reduction—of carbon dioxide emissions only—per unit of GDP by 2030, from the 2005 level. The NDC does not provide modeled GDP projections, so quantitative emissions reduction targets cannot be determined from the NDC.
    - o A peaking of carbon dioxide emissions by "around 2030." The NDC does not provide an absolute target for peak emissions, which, again, makes it difficult to characterize quantitative units of emissions reduction.
- Korea's NDC target:[14] 37 percent reduction of GHG emissions from BAU by 2030, economy wide. The NDC provides the projected BAU emissions at 2020, 2025, 2030, so a quantitative, economy-wide target for these years can be readily determined from the NDC.
- Japan's NDC has an absolute target for all GHGs of a 26 percent emissions reduction by 2030, relative to 2013 levels.[15]

A possibly simplistic conclusion would be that Japan could participate in Article 6.2 transfers; Korea might, depending on the outcome of negotiations on Article 6 MPGs; and China probably could not. Let us add some nuance to this conclusion, though:

- Accounting for ITMOs is for the purpose of compliance with the Paris Agreement—including measuring progress toward achieving one's NDC target(s) and demonstrating avoidance of double counting. Accounting for ITMOs is effectively independent of national policy—or linkage between national policies.[16] Presumably, most Parties (national governments) would indeed like to convert transfers of mitigation units between national policy systems to obtain Paris Agreement credit for related emissions reduction. However, some may not care, in the near term. China, for example, could conceivably engage in transfers of some kind with other East Asian countries, at some point in the future, without regard—in the near term—to how this might affect progress toward its NDC.[17] China or other Parties with non-quantifiable relative targets might choose to do so to learn about linkage and other types of transfers, in preparation for utilizing Article 6.2 with subsequent versions of their NDCs or to render their emissions reduction cost effective (which might be important to them regardless of whether or not such transfers were credited to their current NDCs).
- The challenges associated with Parties having NDC targets such as China's—or even Korea's—participating in Article 6.2 transfers might be addressed in the context of larger, one-time transfers (as contrasted, for example, with linkage between policy systems). Parties to a large, one-time transfer might have the incentive to devote considerable analytical resources to the transaction, sufficient to demonstrate that the parties to the transaction had avoided double counting and satisfied other Article 6.2 obligations, even if their NDCs utilized relative targets that could not be quantified. Kerr et al. (2018) provide an example of how such a one-time transfer might work.
- It remains unclear how Article 6.4 and Article 6.2 will interact. The 6.4 mechanism will have more centralized oversight—from a Convention or Paris Agreement body—than more "bottom-up" 6.2 transfers. It is also assumed that the 6.4 mechanism will incorporate an ERC-type system with some

characteristics of the CDM. It is possible—and perhaps likely—that offset credits or other types of mitigation units generated by a Party's 6.4 activities may be converted in some manner to ITMOs for use in 6.2. Possibly, then, a Party such as China, with a non-quantifiable relative target, might still engage in 6.2 transfers, using ITMOs converted from the 6.4 mechanism. Parties with targets such as Korea's might find it desirable to obtain ITMOs in this manner, as well. (On the relationship between 6.2 and 6.4, see Michaelowa [2017]; Michaelowa and Hoch [2016].)

- Aldy and colleagues (2016a, 2016b) offer possible approaches to comparing effort across NDCs with heterogeneous target types. Their primary purpose is to enhance the Paris Agreement's transparency mechanism—the reporting and review procedures in Article 13—and global stocktake (Article 14). However, such techniques for comparing disparate systems might contribute over time to the ability to ensure proper accounting for Article 6.2 transfers between Parties with relative targets.

Any international carbon market in Northeast Asia (with "market" construed broadly to include various types of transfers and exchanges of mitigation units) is likely to be heavily dominated by China. Given the type of target China employs in its NDC, however, it will be difficult for China to satisfy Article 6.2 requirements for ITMOs (if and when the Chinese government decides it wishes to use 6.2). China and its potential trading partners may take a number of paths to alleviate these difficulties—though the surest path would be for China to adopt a quantifiable—if not absolute—target for emissions reductions in future NDCs.[18]

In the meantime, it is likely that Japan and Korea will find it feasible during the first NDC period to engage in 6.2 transfers. This will depend, however, on how the 6.2 (and broader Paris Agreement) accounting regime deals with Korean ERC-like mitigation units.

The Paris Agreement is designed to accommodate—indeed encourage—learning and iteration. Parties must submit new NDCs every five years, and the Agreement encourages Parties to be more ambitious with each submission. Article 13 reporting and review mechanisms facilitate cross-national learning about climate change policy, and Article 11 (among other provisions) aims to build capacity for implementing the Agreement—including measurement of progress toward achieving NDCs. Learning and iteration in turn, it is hoped, will encourage increased ambition.

International cooperation on mitigation, including transfers of mitigation units, also can encourage increased ambition—by rendering mitigation less costly. Difficulties with quantifying emissions reductions under some NDCs will be an obstacle to utilizing Article 6. This paper has considered how such difficulties might be ameliorated. More important, however, will be for governments to move in the direction of absolute, economy-wide targets in subsequent NDCs.[19] As they do, the current challenges to fully utilizing Article 6.2 in Northeast Asia—and elsewhere—will become less daunting.

ENDNOTES

[1] The author is grateful to Jackson Ewing and Michael Mehling for comments on earlier drafts. See also these authors' contributions to this volume.

[2] World Resources Institute's data on greenhouse gas emissions is available at https://www.climatewatchdata.org/countries/compare?locations=JPN percent2CCHN percent2CKOR#ghg-emissions. World: 48,892 $MtCO_2e$; China: 11,601 $MtCO_2e$; Japan: 1,322 $MtCO_2e$; Korea: 632 $MtCO_2e$. Figures include land-use change and forestry.

[3] National governments that have adopted and ratified the Paris Agreement.

[4] The final version of the Paris Agreement, together with Decision 1/CP.21, which elaborates and supplements the Agreement, is at http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

[5] The following provide insight into Article 6 and its elaboration: Howard et al. (2017), IETA (2017a, 2017b, 4–6), Marcu (2016, 2017a, 2017b), Stua (2017).

[6] NDCs are the mitigation pledges that Parties to the Paris Agreement have submitted, adjunct to the Agreement. The UNFCCC's interim NDC Registry, required by the Agreement's Article 6.12, is at www4.unfccc.int/ndcregistry. As of April 24, 2018, 169 of the UNFCCC's 197 Parties had submitted NDCs. See http://unfccc.int/focus/ndc_registry/items/9433.php. A total of 175 UNFCCC Parties have ratified the Paris Agreement.

[7] On Paris Agreement accounting, see Bodansky (2017), Hood and Soo (2017), Mehling et al. (2017, 31–33), OECD (2017), Schneider et al. (2017).

[8] All Parties to the Kyoto Protocol with mitigation obligations are assigned absolute, economy-wide targets of this type.

[9] See, for example, Dransfeld et al. (2014).

[10] A more cynical observer might say "hypothetical" baseline. The validity of the emissions reduction—whether in an ERC project or an NDC with relative targets—depends on the validity of the method(s) used and the transparency of the process.

[11] See also Vaidyula and Hood (2018, 29—30) for a cogent discussion of this set of issues. A Party could simply use measured quantities of emissions from year to year, if emissions were declining, to characterize mitigation outcomes; presumably, however, if the Party were able to do so—and emissions were indeed declining—it would have adopted an absolute target in its most recent NDC.

[12] The NDCs referenced later are identified in the respective documents as "intended" NDCs, which refers to their status prior to the Paris Agreement coming into force.

[13] China's NDC is at www4.unfccc.int/ndcregistry/PublishedDocuments/China percent20First/China's percent20First percent20NDC percent20Submission.pdf (see p. 5 of the English version for a summary of the NDC targets).

[14] Korea's NDC is at www4.unfccc.int/ndcregistry/PublishedDocuments/Republic percent20of percent20Korea percent20First/INDC percent20Submission percent20by percent20the percent20Republic percent20of percent20Korea percent20on percent20June percent2030.pdf.

[15] Japan's NDC does not explicitly state that this target is economy wide, but that is assumed to be the case. Japan's NDC is at www4.unfccc.int/ndcregistry/PublishedDocuments/Japan percent20First/20150717_Japan's percent20INDC.pdf.

[16] At present, linkage is only between ETSs—the best current example being at the subnational level among California, Québec, and Ontario. In the future, governments might link heterogeneous policy systems—for example, an ETS and a carbon-tax system (Mehling et al. 2017). The accounting within the linked system would be more complex than that in a system of linked ETSs, but the distinction illustrated here would remain valid.

[17] Of course, counterparties to the transaction would have to be similarly indifferent to use of the transfers in Paris Agreement accounting.

[18] Chinese policy makers have indeed indicated an intention to move, over time, toward using a hard cap on emissions. In addition, China is gathering some experience through several subnational ETS pilot programs (Zhang et al. 2017) and through a program of absolute caps on energy consumption (coal equivalent), as specified in the 13th and 14th five-year plans (Chen and Stanway 2016).

[19] Article 4.4 provides a certain amount of guidance in this regard.

REFERENCES

Aldy, Joseph E., William A. Pizer, and Keigo Akimoto. “Comparing Emissions Mitigation Efforts across Countries.” *Climate Policy* 17, no. 4 (2016a): 501–15, https://doi.org/10.1080/14693062.2015.1119098.

Aldy, Joseph, William Pizer, Massimo Tavoni, Lara Aleluia Reis, Keigo Akimoto, Geoffrey Blanford, Carlo Carraro, Leon E. Clarke, James Edmonds, Gokul C. Iyer, Haewon C. McJeon, Richard Richels, Steven Rose, and Fuminori Sanoet. “Economic Tools to Promote Transparency and Comparability in the Paris Agreement.” *Nature Climate Change* 6 (2016b): 1000–1004, https://doi.org/10.1038/nclimate3106.

Bodansky, Daniel. “Elaborating the Paris Agreement: Information and Accounting.” Center for Climate and Energy Solutions (November, 2017), www.c2es.org/site/assets/uploads/2017/11/elaborating-paris-agreement-information-accounting-11-17.pdf.

Chen, Kathy and David Stanway. “China Sets Cap for Energy Consumption for First Time.” *Reuters* (March 4, 2016), www.reuters.com/article/us-china-parliament-energy-idUSKCN0W703V.

Dransfeld, Björn, Stephan Hoch, Matthias Honegger, and Axel Michaelowa. “Developing Sectoral Mechanisms in the Transition Period towards a New Climate Treaty.” German Federal Environment Agency (May, 2014), www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Forschungsdatenbank/fkz_3713_41_506_klimaschutzabkommen_bf.pdf.

Ewing, Jackson. “Roadmap to a Northeast Asian Carbon Market.” Asia Society Policy Institute (September, 2016), https://asiasociety.org/policy-institute/roadmap-northeast-asian-carbon-market.

Ewing, Jackson. “Building the Evidence Base for Carbon Market Linkage in Northeast Asia.” Asia Society Policy Institute White Paper (December 15, 2017), https://asiasociety.org/sites/default/files/2017-12/White percent20Paper percent20-percent20Building percent20the percent20Evidence percent20Base percent20for percent20Carbon percent20Market percent20Linkage percent20in percent20Northeast percent20Asia.pdf.

Ewing, Jackson and Minyoung Shin. “Northeast Asia and the Next Generation of Carbon Market Cooperation.” Asia Society Policy Institute (December 2017), https://asiasociety.org/policy-institute/northeast-asia-and-next-generation-carbon-market-cooperation.

Goulder, Lawrence. “Linking China’s Cap-and-Trade System with Other Systems: Key Challenges,” in *Market Mechanisms and the Paris Agreement*, eds. Robert N. Stavins and Robert C. Stowe (Cambridge, MA: Harvard Project on Climate Agreements, 2017), 93–96, www.belfercenter.org/publication/market-mechanisms-and-paris-agreement.

Goulder, Lawrence H. and Richard D. Morgenstern. “China’s Rate-based Approach to Reducing CO_2 Emissions: Strengths, Limitations, and Alternatives.” Paper presented at the Annual Meeting of the American Economic Association, Philadelphia, PA, January 2018, https://pdfs.semanticscholar.org/82fd/a1d1cb5d4ca690f8fe22b891f92765ec2dea.pdf.

Hood, Christina and Carly Soo. “Accounting for Mitigation Targets in Nationally Determined Contributions under the Paris Agreement.” *OECD iLibrary* (November 2017), https://doi.org/10.1787/63937a2b-en.

Howard, Andrew, Thiago Chagas, Jelmer Hoogzaad, and Stephan Hoch. 2017. “Features and Implications of NDCs for Carbon Markets.” Amsterdam: Climate Focus (June 2017), www.climatefocus.com/publications/features-and-implications-ndcs-carbon-markets-final-report.

ICAP (International Carbon Action Partnership). 2018. Various country reports, updated frequently. https://icapcarbonaction.com/en.

IETA (International Emissions Trading Association). "Article 6 of the Paris Agreement, Implementation Guidance: An IETA 'Straw Proposal.'" International Emissions Trading Association (November 2017a), www.ieta.org/resources/UNFCCC/Straw percent20Proposal/IETA percent20Article percent206 percent20Straw percent20Proposal percent20November percent202017.pdf.

IETA. "COP-23 Summary Report" (November 2017b), www.ieta.org/resources/COP percent2023/COP23-Summary-Report.pdf.

Karplus, Valerie. "Laying the Foundation for CO_2 Emissions Trading in China," in Stavins and Stowe, *Market Mechanisms*, 83–86.

Kerr, Suzi, Ruben Lubowski, and Robert Heilmayr. "Climate Teams: A New Model for Investor-Host Climate Cooperation," in *International Cooperation in East Asia to Address Climate Change*, eds. Robert N. Stavins and Robert C. Stowe (Cambridge, MA: Harvard Project on Climate Agreements, 2018), 73–76, www.belfercenter.org/publication/international-cooperation-east-asia-address-climate-change.

Marcu, Andrei. "Carbon Market Provisions in the Paris Agreement (Article 6)." Special Report 128 (Brussels: Centre for European Policy Studies, 2016), www.ceps.eu/publications/carbon-market-provisions-paris-agreement-article-6.

Marcu, Andrei. "Governance of Article 6 of the Paris Agreement and Lessons Learned from the Kyoto Protocol." Paper No. 4. Fixing Climate Governance Series (Waterloo, Ontario, Canada: Centre for International Governance Innovation, 2017a), www.cigionline.org/publications/governance-article-6-paris-agreement-and-lessons-learned-kyoto-protocol.

Marcu, Andrei. 2017b. "Article 6 of the Paris Agreement: Structure, Interpretation, Possible Outcomes," in Stavins and Stowe, *Market Mechanisms*, 59–62.

Mehling, Michael, Gilbert Metcalf, and Robert Stavins. "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)." (Cambridge, MA: Harvard Project on Climate Agreements, 2017), www.belfercenter.org/publication/linking-heterogeneous-climate-policies-consistent-paris-agreement.

Michaelowa, Axel. "The Paris Market Mechanisms' Contribution to Global Greenhouse Gas Mitigation: Complementarities and Tensions between Article 6.2 and Article 6.4," in Stavins and Stowe, *Market Mechanisms*, 63–66.

Michaelowa, Axel and Stephan Hoch. "Built on Experience: How to Transition from the CDM to the Sustainable Development Mechanism under the Paris Agreement." *Carbon Mechanism Review* (April 2016): 28–31, www.carbon-mechanisms.de/en/publications/details/?jiko percent5Bpubuid percent5D=454.

OECD (Organisation for Economic Co-operation and Development). "Workshop on 'Corresponding Adjustment' as Part of Article 6 Accounting: Workshop Summary." OECD/IEA Project for the Climate Change Expert Group (February 20, 2017), https://www.oecd.org/environment/cc/Workshop_Summary_OECD_IEA.pdf.

Schneider, Lambert, Jürg Füssler, Anik Kohli, Jakob Graichen, Sean Healy, Martin Cames, Derik Broekhoff, Michael Lazarus, Stephanie La Hoz Theuer, and Vanessa Cook. "Robust Accounting of International Transfers under Article 6 of the Paris Agreement." Discussion Paper presented by the German Emissions Trading Authority, Berlin, Germany, September 2017. www.dehst.de/SharedDocs/downloads/EN/project-mechanisms/Robust_accounting_paris_agreement_discussion_paper.html.

Stavins, Robert N. and Robert C. Stowe, eds. *Market Mechanisms and the Paris Agreement* (Cambridge, MA: Harvard Project on Climate Agreements, 2017), www.belfercenter.org/publication/market-mechanisms-and-paris-agreement.

Stavins, Robert N. and Robert C. Stowe, eds. *International Cooperation in East Asia to Address Climate Change* (Cambridge, MA: Harvard Project on Climate Agreements, 2018), www.belfercenter.org/publication/international-cooperation-east-asia-address-climate-change.

Stua, Michele. “A Transformational Club within the Paris Agreement: A Climate-Club Perspective on Article 6,” in Stavins and Stowe, *Market Mechanisms*, 67–72.

SBSTA (United Nations Framework Convention on Climate Change, Subsidiary Body on Scientific and Technological Advice). “Guidance on Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement; Round-Table Discussion among Parties Held on 5 November 2017; SBSTA 47, Agenda Item 11(a); Informal Document by Co-Facilitators of the Round-Table” (Bonn, Germany: UNFCCC, 2017), http://unfccc.int/files/meetings/bonn_nov_2017/application/pdf/sbsta47_rt_6.2_cf_informal_document_11a.pdf.

SBSTA. “Rules, Modalities and Procedures for the Mechanism Referred to in Article 6, Paragraph 4, of the Paris Agreement; Round-Table Discussion among Parties Held on 4 November 2017; SBSTA 47, Agenda Item 11(b); Informal Document by Co-Facilitators of the Round-Table” (Bonn, Germany: UNFCCC, 2017b), http://unfccc.int/files/meetings/bonn_nov_2017/in-session/application/pdf/sbsta47_rt_6.4_cf_informal_documen_6.4.pdf.

Vaidyula, Manasvini and Christina Hood. 2018. “Accounting for Baseline Targets in NDCs: Issues and Options for Guidance: Climate Change Expert Group Paper No. 2018(2).” OECD/IEA (April 2018), www.oecd.org/environment/cc/Accounting_for_baselines_targets_in_NDCS.pdf.

Zhang, Junjie, Zhenxuan Wang, and Xinming Du. 2017. “Lessons Learned from China’s Regional Carbon Market Pilots.” *Economics of Energy & Environmental Policy* 6, no. 2 (2017), https://doi.org/10.5547/2160-5890.6.2.jzha.

5. The Use of Quantitative Models to Assess the Impacts of Carbon Market Integration

KIRBY LEDVINA AND NIVEN WINCHESTER

INTRODUCTION

FOLLOWING THE PARIS CLIMATE AGREEMENT, many nations are formulating policies to meet the emissions targets for 2030 pledged in their nationally determined contributions (NDCs), on top of existing measures to curb greenhouse gases (GHGs) in some regions. Cooperation among carbon markets through international trading of emissions rights provides scope for lowering the costs of reducing emissions. The linking of carbon markets allows emissions abatement to occur where their costs are lowest, and regions taking on additional reductions are compensated by financial transfers from high-cost regions. Mechanisms to allow international trading of emissions rights are included in several existing policies, and there is interest in including such measures in future policies.

Estimating the impacts of carbon market integration requires the application of quantitative models. Applied general equilibrium (AGE) models—also known as computable general equilibrium (CGE) models—are commonly used to provide numerical estimates of the economic and emissions outcomes of climate policies. AGE models can also estimate the impact of international trading of emissions rights between two or more nations by leveraging the (implicit) marginal abatement cost (MAC) curves embedded in these models. As AGE models have an economy-wide perspective, they are also able to evaluate the broader economic impacts of international trading of emissions permits.

> China, Japan, and Korea face both a high level of complexity in evaluating the costs, benefits, and trade-offs of potential linkage and the potential for symbiotic relationships.

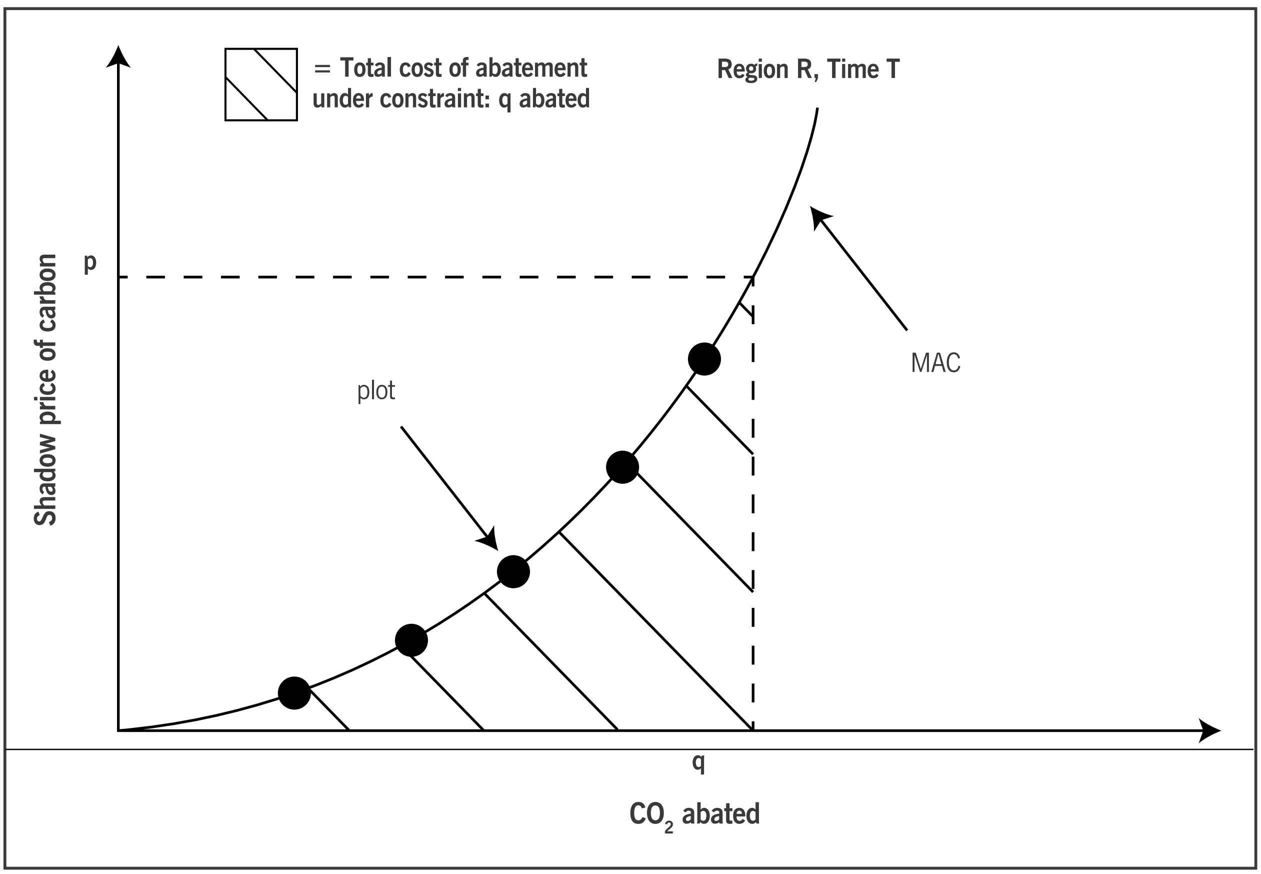
This chapter has four further sections. Section two provides an overview of MAC curves and illustrates how international trading of emissions permits can lower abatement costs. Section three provides an overview of AGE models used for climate policy analysis, outlines how marginal abatement cost curves can be derived from these models, and discusses the broader economic impacts of international permit trading that are captured by AGE models. Section four reviews selected AGE studies that estimate the impacts of international trading of emissions permits. The final section concludes.

These modeling approaches have import for any jurisdictions considering carbon market linkage, including Northeast Asia. As a region with disparate economic and political systems, climate change goals, and emissions trading system (ETS) designs (see chapters one and seven of this volume), China, Japan, and the Republic of Korea (hereafter Korea) face both a high level of complexity in evaluating the costs, benefits, and trade-offs of potential linkage and the potential for symbiotic relationships. As will be demonstrated in this chapter, AGE models oriented toward MAC curves can shed light on these cross-border considerations, including how the emission reduction policies pursued will impact wider economic and social welfare dynamics.

MARGINAL ABATEMENT COST CURVES AND INTERNATIONAL TRADING OF EMISSIONS PERMITS

Mac curves describe the potential cost of emissions reduction policies, such as a cap on carbon dioxide (CO_2) emissions. Specifically, MAC curves relate the marginal cost of abatement to the total quantity of emissions abated. Because the market first adopts lower-cost options, the total cost of abatement is the area under the MAC curve, that is, the sum of the marginal costs of each ton abated, as illustrated in Figure 5.1.

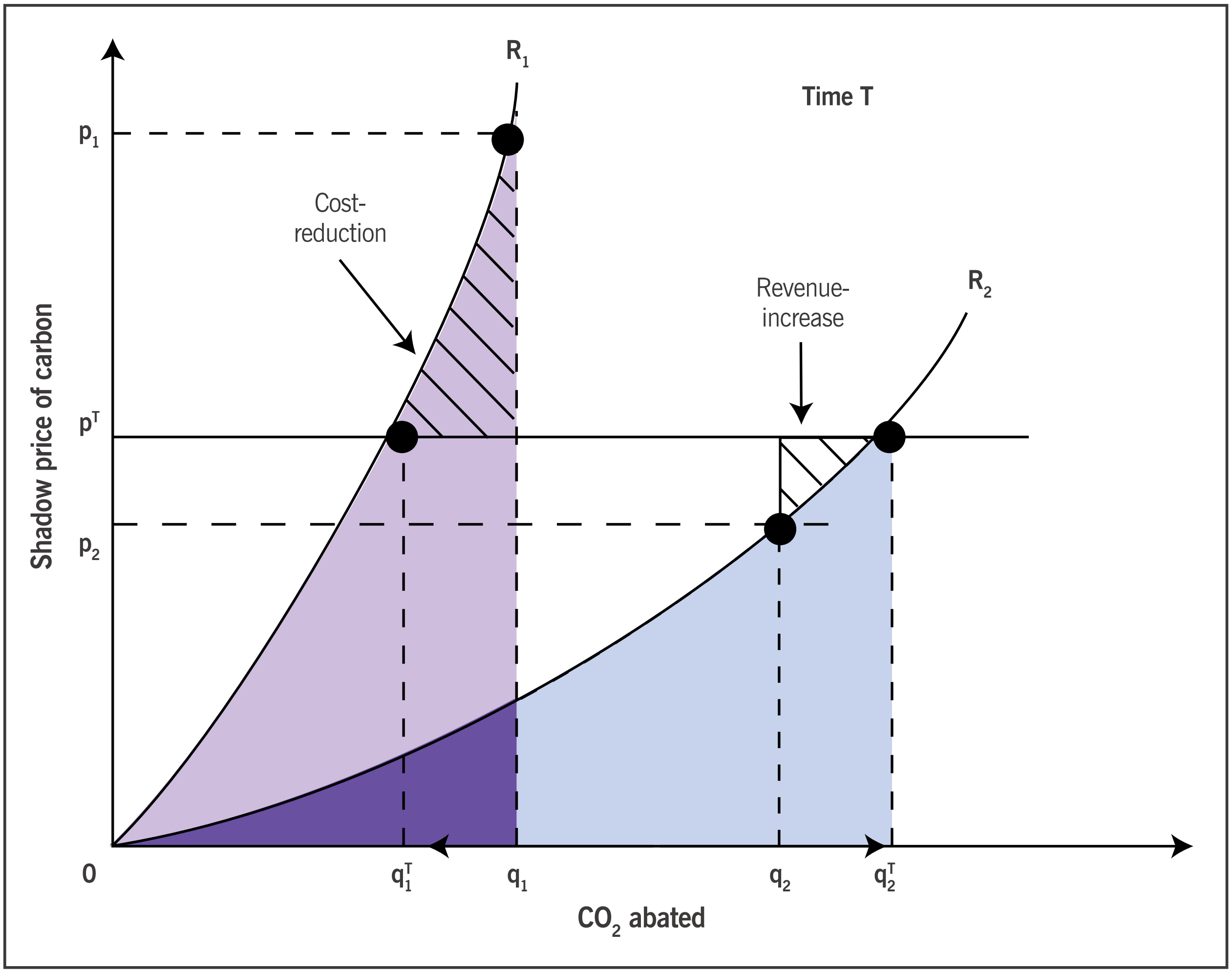
FIGURE 5.1. MARGINAL ABATEMENT COST (MAC) CURVE AND TOTAL COST OF ABATEMENT



Source: Modified from Denny Ellerman and Annelène Decaux, "Analysis of Post-Kyoto CO_2 Emissions Trading Using Marginal Abatement Curves," *Joint Program Report Series Report 40*, 24 pp., 1998, https://globalchange.mit.edu/sites/default/files/MITJPSPGC_Rpt40.pdf

MAC curves can also convey the potential gains from emissions permit trading among regions with different abatement costs. As an example, imagine a two-region world in which one region (Region 1) needs to reduce emissions by quantity *q1*, and the other region (Region 2) needs to reduce emissions by quantity *q2*. In addition, assume that Region 1 faces a higher cost of abatement than does Region 2, as illustrated by the two MAC curves in Figure 5.2. Without trading, Region 1 and Region 2 face marginal abatement costs of p1 and p2, respectively, with the resulting total costs shaded in blue for Region 1 and red for Region 2. However, with trading, both regions face a common trade price p^T such that $p2 < p^T < p^1$. Per the equimarginal principle, both regions will reduce their emissions until the marginal cost of reduction equals p^T, the marginal revenue of emissions permit sales. Thus, Region 2 will increase its total abated emissions to $q2^T > q2$ and will sell emissions permits at this higher trade price to Region 1. Conversely, Region 1 has

FIGURE 5.2. MARGINAL ABATEMENT COST (MAC) CURVE AND GAINS FROM TRADE



Source: Modified from Denny Ellerman and Annelène Decaux, "Analysis of Post-Kyoto CO_2 Emissions Trading Using Marginal Abatement Curves," *Joint Program Report Series Report 40*, 24 pp., 1998, https://globalchange.mit.edu/sites/default/files/MITJPSPGC_Rpt40.pdf an incentive to decrease its total emissions abatement to $q1^T < q1$ and shift its remaining reduction burden to Region 2 at the trade price. Consequently, compared to a world without trade, a trade price pT yielding the same aggregate emissions reduction ($q1 + q2 = q1^T + q2^T$) could create gains from trade in both regions. In this two-region example, trade gains are a cost-reduction for Region 1 and a revenue-increase for Region 2, as indicated by the striped regions in Figure 5.2.

The relationship portrayed in this hypothetical scenario is particularly relevant for Northeast Asia, where Japan, Korea, and China face different domestic abatement costs that could yield symbiotic economic efficiency gains if markets were to link (Ewing, 2016; Ewing and Shin, 2017). Japan and Korea have a relative paucity of low-cost emissions options domestically compared to China, which in turn could benefit from the revenue generation opportunities of selling permits abroad.

THE IMPACT OF EMISSIONS TRADING IN ECONOMY-WIDE MODEL

Applied General Equilibrium Models for Climate Policy Analysis

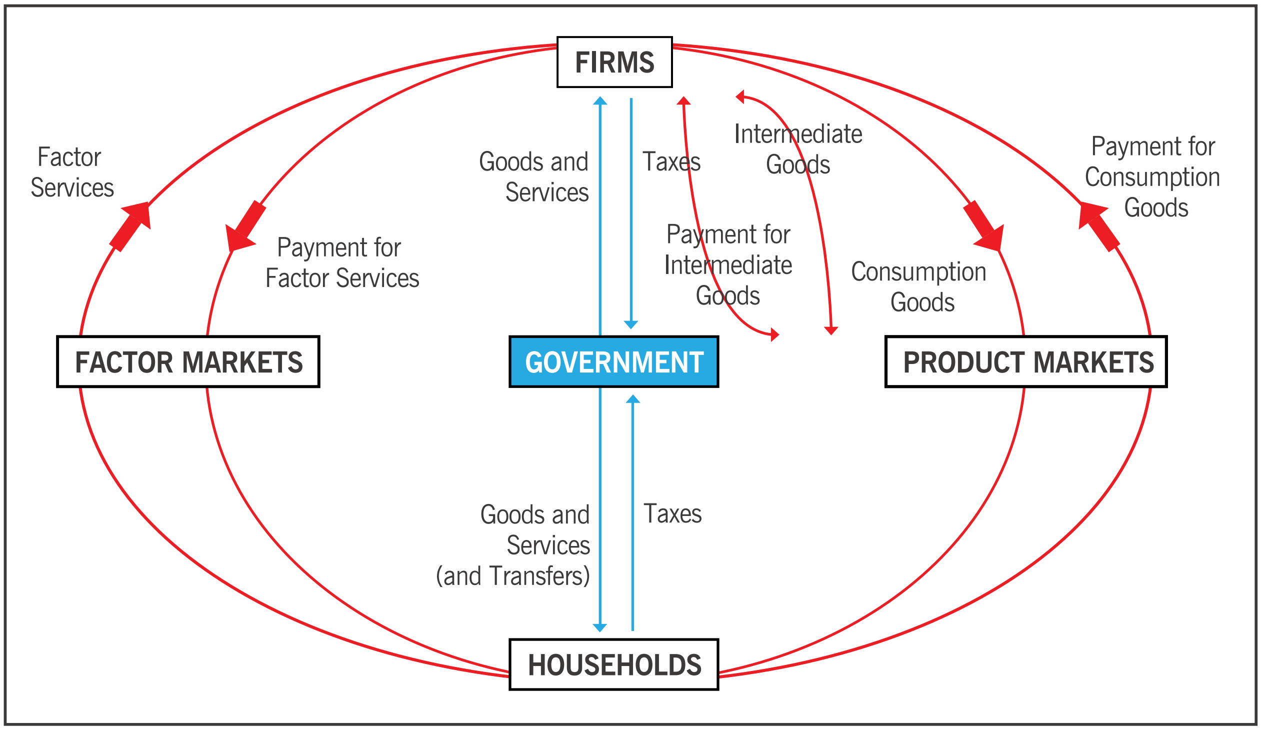
AGE models used for climate policy analysis represent economies as a series of interconnected sectors, include a detailed representation of energy production, and link production to GHG emissions. AGE models are simulation tools that combine general equilibrium theory with realistic economic data to solve numerically for the levels of supply, demand, and price that support equilibrium across all markets (Sue Wing, 2004). These models also capture interactions among regions through imports and exports. AGE models are particularly useful for evaluating how policies targeting a small number of sectors will be transmitted to other sectors and have economy-wide impacts. These models have become increasingly popular for quantitative policy analysis and are widely used to analyze climate policies—see, for example, Caron et al. (2015) and Winchester et al. (2010).

Japan and Korea have a relative paucity of low-cost emissions options domestically compared to China, which in turn could benefit from the revenue generation opportunities of selling permits abroad.

AGE models represent interactions among three types of agents: households, firms, and the government, as illustrated in Figure 5.3. Households own the factors of production (e.g., labor, capital, and natural resources) that they rent to firms and use this income to purchase goods and services. In each sector, firms produce commodities by combining factors of production and intermediate inputs (i.e., goods produced by other sectors). The government sets policies and collects tax revenue, which it spends on providing goods and services for households and on transfer payments to households. Equilibrium is obtained through a series of markets (for both factor of production and goods and services) that determine prices so that supply equals demand.

An important characteristic of AGE models is the representation of inter-sectoral linkages through each firm's use of intermediate inputs. Purchases of intermediate inputs are captured in input-output tables used to calibrate AGE models. For each sector, these tables list the value of output produced and the value of each input used, which can be linked to physical quantities (e.g., tons of coal). For example, the coal power sector will use inputs of capital and labor and output from the coal-mining sector along with other intermediate inputs to produce electricity. These inter-sectoral linkages allow AGE models to evaluate how policy changes will propagate throughout an economy.

FIGURE 5.3. THE STRUCTURE OF AN AGE MODEL



Source: Arun Singh, "Clean Development Pathways for India: Evaluating Feasibility and Modeling Impact of Policy Options" (Master of Science thesis, Technology and Policy Program, Massachusetts Institute of Technology (MIT), June 2017) https://globalchange.mit.edu/sites/default/files/Singh_MS_2017.pdf.

Other key features of AGE models include the representation of competition from competing technologies/sectors and substitution possibilities among inputs. For instance, an increase in the price of coal-based electricity will provide scope for the expansion of electricity generation from other sources, such as wind and solar. At the same time, an increase in electricity prices will incentivize firms to use electricity more efficiently by investing in more efficient plants, at an additional cost, than they would have in the absence of the price increase.

Marginal Abatement Cost Curves in Applied General Equilibrium Models

MAC curves can be constructed using an AGE model to calculate the shadow price of a particular emissions constraint. For carbon reduction policies, the shadow price of the constraint is equivalent to the cost of abating an additional unit of CO_2 emissions. Thus, for a given region and time, the marginal costs for different levels of abatement are determined, and MAC curves are assembled as increasing functions of the total reduction in emissions.

Drivers of abatement costs in AGE models include (1) the existing energy mix, (2) the scope to substitute among fuels, (3) the responsiveness of efficiency improvements to rising (gross of carbon charges) energy costs, (4) the availability and cost of low-carbon energy sources, and (5) consumers' willingness to substitute among goods with different CO_2 intensities. Thus, MAC curves are not directly specified in AGE models but depend on the calibration and interactions among the drivers of abatements costs. However, a MAC curve can be derived as a response surface from an AGE model and is thus implicitly embedded in these models.

As explained by Morris et al. (2012), MAC curves vary by region, time period, and greenhouse gas and thus are sensitive to key modeling decisions. For example, cost estimates within a region are affected by the region's historical policies as well as the policies of the region's trading partners. Furthermore, in light of these sensitivities, the CO_2 permit price should not be interpreted as a welfare cost, with welfare defined as the change in a nation's aggregate consumption. In neoclassical economics, the optimal, welfare-maximizing production and consumption levels are at the point where the marginal welfare of consumption equals the marginal cost of production, which is the carbon price in the context of a permit-trading system. However, as demonstrated by Goulder (1995), a CO_2 price may not be a reliable indicator of welfare costs amid preexisting energy policies and taxes. Nevertheless, a MAC analysis can provide valuable insights into the potential costs of permit trading and other emissions reduction policies, provided that precautions are taken in the MAC curve development and interpretation.

The Broader Economic Impacts of International Trading of Emissions Permits

Analyses of international permit trading using AGE models also evaluate broader economic impacts, such as interaction with preexisting economic distortions (e.g., taxes and subsidies) and terms of trade effects. Interactions between international permit trading and preexisting distortions may have a negative impact on welfare if international trading causes an economy to increase production from sectors with relatively high taxes or subsidies. On the contrary, there will be additional welfare increases if international permit trading induces expansion of sectors with relatively low preexisting distortions. A nation that exports emissions permits may face a negative terms-of-trade effect if the increase in the permit price decreases the competitiveness of that nation's exports of goods and services. If the terms-of-trade effect is large enough, a permit exporter may experience a decline in welfare due to international permit trading. On the other hand, an importer of emissions rights may experience an increase in the competitiveness of its exports due to a decrease in the domestic permit prices. As terms-of-trade effects sum to zero, they do not affect the global welfare impacts of international permit trading, but their distributional impacts across countries can be significant.

For Northeast Asian stakeholders, from firms to governments to citizens, these final points are particularly salient. As with other commodities, the terms of trade for carbon permits in a potential linked system would be intrinsically competitive and likely rivalrous (Marcu, 2018). Policy makers in each country will weigh any prospective linkage from such a cost-benefit analysis, which includes all of the relational information captured by an AGE model as well as more qualitative concerns (political considerations, historical relationships, geopolitical contexts, etc.) that are not specifically targeted.

THE IMPACT OF INTERNATIONAL TRADING OF EMISSIONS PERMITS

Many studies have compared the costs of meeting emissions targets with and without trading, often showing that permit trading results in significant cost reductions. Ellerman and Decaux (1998) evaluate the regional costs of meeting Kyoto Protocol commitments under both permit trading and non-trading scenarios. They assess abatement costs using MAC curves derived from Version 2.6 of the MIT Emissions Prediction and Policy Analysis (EPPA) model for six Annex B regions—defined as the United States, Japan, European

Union, Other OECD Countries, Eastern Europe, and former Soviet Union—in the year 2010. Compared to the non-trading case, permit trading among Annex B countries results in a trade price of USD 127 per ton and a reduction in total abatement cost of USD 66 billion. Japan and the European Union (EU) accrue USD 26 billion of these gains because of their high marginal abatement costs in a no-trade world (USD 584 per ton in Japan and USD 273 per ton in the EU). Moreover, the inclusion of non–Annex B regions in a trading scenario results in a trading price of USD 24 per ton and reduces global abatement cost to USD 11 billion from USD 120 billion without trade.

Similarly, Babiker et al. (2000) use Version 3 of the EPPA model to compare the trading and non-trading abatement costs associated with Kyoto commitments and also find that permit trade among Annex B countries results in substantial welfare gains. For example, in the United States, the marginal abatement cost decreases by 55 percent from USD 205 per ton without trade to USD 92 per ton with Annex B trading. Additionally, Babiker et al. (2000) observe that Annex B trading lessens the drop in energy prices resulting from the CO_2 cap, which in turn moderates the welfare losses faced by oil exporting nations.

Extending beyond the early focus on MAC curves and trade gains, more recent work demonstrates the ability of AGE models to capture the nuances of international emissions trading. Qi et al. (2013) evaluate various combinations of existing or proposed national carbon markets in the EU, the United States, Australia–New Zealand (ANZ), and China. They find that each region's permit trade position depends on the system's coverage. For example, an EU-ANZ-China linked market results in a permit price of USD 11.2 per ton and makes the EU a permit importer. However, the addition of the US makes the EU a permit exporter at a trade price of USD 17.5 per ton. This work demonstrates that the use of an AGE model to represent various market structures can produce valuable insights into countries' potential permit-trading positions.

Other studies focus on the welfare implications of international permit trading while accounting for broader economic impacts, challenging the assumption that welfare improves for all trade parties. Babiker et al. (2004) use an AGE framework to explore the distortionary impacts of preexisting energy taxes and the terms of trade effect. They consider Annex B countries within the EU under scenarios without trading, with trading, and with trading under fewer distortions. They determine that implementation of a trading system can exacerbate the welfare losses from an emissions cap in permit-exporting countries because the negative terms-of-trade effect of exporting outweighs the income gains. For example, relative to a non-trading scenario, permit trading results in a 0.0026 percent increase in welfare in Great Britain when there are 50 percent fewer distortions but causes a 0.51 percent decrease in welfare with full preexisting distortions.

Gavard et al. (2011) also explore the welfare impacts of trading, focusing on sectoral trading between developed and developing countries. They use an AGE model to accommodate a US-China carbon market with an economy-wide cap in the United States and a sectoral cap on emissions from electricity generation in China, a feature that allows the model to capture emissions leakage from capped to uncapped sectors. They observe that under unlimited sectoral trading in China and the United States, a cap on emissions in China's electricity sector causes a 15 percent decrease in the price of coal. However, other sectors in China substitute toward the cheaper coal and negate 19 percent of the electricity sector's emissions reductions. Additionally, while US welfare increases by USD 88 billion in 2030 relative to a no-trade scenario, Chinese welfare decreases by USD 6 billion due to negative terms of trade effects. Expanding on this work, Gavard et al. (2016) consider international emissions trading with an upper limit on the quantity of permits that are traded and compare the effects of limited and unlimited permit trading. If the upper limit is binding, carbon prices will not be equalized across linked carbon markets. They use a certificate system to limit the trade of permits. Under this structure, each CO_2 permit traded requires a trade certificate, but certificates are limited in supply and can be allocated to either the United States or China. Gavard et al. (2016) conclude that if revenue from a trade certificate system (which represents rent from purchasing emissions rights at a lower cost than the selling price) is allocated to the developing country, it is possible for both trade parties to benefit relative to a no-trade case.

Webster et al. (2010) assess the value of emissions trading as a hedge against uncertain economic growth, finding that emissions trading under uncertainty could often be welfare worsening in any region. Such uncertainty is significant because economic growth impacts future emissions levels and thus the optimal emission caps. Webster et al. (2010) analyze several policy variations with and without uncertainty, using both a partial equilibrium model and an AGE model, and find that only the AGE model captures fuel tax distortions and terms-of-trade effects in its estimates of regional welfare change.

Nevertheless, AGE models are based on several simplifying, albeit informed, assumptions and thus struggle to capture short-term market volatility. Reilly and Paltsev (2006) attempt to use an AGE model to identify the driving forces behind the unexpectedly high permit prices in the EU emissions trading system beginning in 2005. They develop scenarios to represent the leading theories (e.g., that drought and high temperatures constrained hydro generation) but could replicate the observed permit prices only with an extreme scenario surrounding expectations on the bankability of permits. Reilly and Paltsev (2006) conjecture that the early spike in the observed price trend would not be representative of future prices, and, indeed, prices fell from their peak of about EUR 30 per ton in April 2006 to around EUR 15 per ton in the summer of 2006 (Ellerman and Buchner, 2008). This work highlights the difficulty of using AGE models to capture short-term market volatility and suggests that AGE models are better suited to evaluate long-term trends and impacts.

Policy-making communities in Northeast Asia would do well to embrace these limitations early on. Running AGE model simulations on different forms of linkage can provide invaluable insights into broad cost-benefit calculations. These simulations are unlikely to provide accurate, granular information on near-term price discovery and the day-to-day machinations of such a linked market.

CONCLUSION

Quantitative models can estimate the economic and emissions impacts of climate policies and the trading of emissions rights among regions. AGE models represent economies as a series of interlinked markets, include a detailed representation of energy production, and link production to GHG emissions. Abatement costs in AGE models reflect assumptions concerning the responsiveness of efficiency improvements to changes in energy prices, the availability and cost of low-carbon energy sources, and other characteristics. These factors give rise to implicit MAC curves. International trade of emissions rights will result in deeper emissions cuts in regions with lower marginal abatement costs and smaller emissions reductions in regions with higher abatement costs, which also compensate regions for taking on additional emissions reductions.

Owing to their economy-wide nature, AGE models are also able to evaluate the broader economic impacts of international trading of emissions permits. For example, the increase in the emissions price in a nation that exports emissions permits will decrease the competitiveness of exports of goods and services from that nation. Previous numerical studies of the impacts of integrating carbon markets reveal that international permit trading can lower the costs of reducing emissions and that broader economic impacts can be substantial.

AGE models are therefore useful tools for exploring market linkage scenarios in Northeast Asia both for the maturation of domestic systems and for possible future linkage. They can help reveal relationships between different domestic policy instruments at the intersection of environmental and economic policy making. China is employing a mix of command and control measures alongside multiple market instruments (Ewing, 2017). Japan mixes international offsets, a national carbon tax, selective subsidies, and voluntary and subnational carbon markets (see chapter nine of this volume). Korea's ETS is enmeshed in a wider green growth policy space replete with market incentives and non-market regulations designed to drive energy efficiency and a transition toward cleaner energy sources (IEA, 2018).

For regional linkage scenarios, AGE models can provide policy makers with a clearer—if imperfect—sense of the benefits and trade-offs linkage will entail for their national position. Given the wealth of support on the mitigation and economic value of international carbon market integration (see chapter four of this volume), it is likely that such modeling will reveal net positive gains for China, Japan, and Korea. Most practically, modeling these relationships under different linkage scenarios can help policy makers reach decisions about the value and resulting prioritization of linking efforts, and the pathways that can be most palatable for their national interests.

REFERENCES

Babiker, M., J. Reilly, and L. Viguier. "Is International Emissions Trading Always Beneficial?" *Energy Journal* 25, no. 2 (2004): 33–56, www.iaee.org/en/publications/journal.aspx.

Babiker, M., J. M. Reilly, and H. D. Jacoby. (2000): "The Kyoto Protocol and Developing Countries." *Energy Policy*, 28 (2000): 525–536, http://dx.doi.org/10.1016/S0301-4215(00)00033-1.

Caron, J., S. Rausch, and N. Winchester. "Leakage from Sub-National Climate Policy: The Case of California's Cap-and-Trade Program." *Energy Journal*, 36, no. 2 (2015), https://ideas.repec.org/a/aen/journl/ej36-2-08.html.

Ellerman, A. D. and B. K. Buchner. "Over-Allocation or Abatement? A Preliminary Analysis of the EU ETS Based on the 2005–06 Emissions Data." *Environmental and Resource Economics*, 41, no. 2 (2008): 267–287, https://doi.org/10.1007/s10640-008-9191-2.

Ellerman, A. D. and A. Decaux. "Analysis of Post-Kyoto CO_2 Emissions Trading Using Marginal Abatement Curves." *Joint Program Report Series Report 40*, 24 pp., 1998, http://globalchange.mit.edu/publication/15652.

Ewing, J. "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, http://asiasociety.org/files/RoadmapNortheastern-final-online+.pdf.

Ewing, J. "China's ETS at Home and Abroad," Carbon Pricing Leadership Coalition, August 29, 2017, www.carbonpricingleadership.org/blogs/2017/8/29/chinas-ets-at-home-and-abroad.

Ewing, J. and M. Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, https://asiasociety.org/sites/default/files/2017-12/NextGen percent20Report percent20FINAL percent20WEB.pdf.

Gavard, C., N. Winchester, H. Jacoby, and S. Paltsev. "What to Expect from Sectoral Trading: A US-China Example." *Climate Change Economics*, 2, no. 1(2011): 9–26, https://doi.org/10.1142/S201000781100019X.

Gavard, C., N. Winchester, and S. Paltsev "Limited Trading of Emissions Permits as a Climate Cooperation Mechanism? US-China and EU-China Examples." *Energy Economics*, 58 (2016): 95–104, https://doi.org/10.1016/j.eneco.2016.06.012.

Goulder, L. H. "Environmental Taxation and the Double Dividend: A Reader's Guide." *International Tax and Public Finance*, 2, no. 2 (1995): 157–183, https://doi.org/10.1007/BF00877495.

International Energy Agency. "National Strategy for Green Growth." 2018, www.iea.org/policiesandmeasures/pams/korea/name-39013-en.php.

Marcu, A. "Northeast Asian Carbon Markets and Trade Connections." Asia Society Policy Institute, 2018.

Morris, J., S. Paltsev, and J. Reilly. "Marginal Abatement Costs and Marginal Welfare Costs for Greenhouse Gas Emissions Reductions: Results from the EPPA Model." *Environmental Modeling* & *Assessment*, 17, no. 4 (2012): 325–336, https://doi.org/10.1007/s10666-011-9298-7.

Qi, T., N. Winchester, V. Karplus, and X. Zhang. "The Energy and Economic Impacts of Expanding International Emissions Trading." *Joint Program Report Series Report 248*, 19 pp. (2013), http://globalchange.mit.edu/publication/1609.

Reilly, J. M. and S. Paltsev. "European Greenhouse Gas Emissions Trading: A System in Transition," in *Economic Modelling of Climate Change and Energy Policies*, eds. C. de Miguel, X. Labandeira, and B. Manzano. Cheltenham, UK; Northampton, MA: Edward Elgar Publishing, 2006, Chapter 4, pp. 45–64, wwwe-elgar.co.uk/Bookentry_Main.lasso?id=4025.

Sue Wing, I. "Computable General Equilibrium Models and Their Use in Economy-Wide Policy Analysis." *Joint Program Technical Note #6*, 50 pp., 2004, http://globalchange.mit.edu/publication/13808.

Webster, M., S. Paltsev, and J. Reilly. "The Hedge Value of International Emissions Trading under Uncertainty." *Energy Policy,* 38, no. 4 (2010), 1787–1796, https://doi.org/10.1016/j.enpol.2009.11.054.

6. Barriers to Linking Carbon Markets in Northeast Asia

BARAN DODA

SUMMARY

LINKING CARBON MARKETS can generate sizeable economic, environmental, and strategic gains, yet linking is not without its costs. These costs may frustrate carbon market integration in Northeast Asia even when integration is beneficial. This chapter reviews the economic and political barriers to linking that are behind these costs, first from a general theoretical perspective and then in the specific context of the carbon markets in China, Japan, and the Republic of Korea (hereafter Korea). It highlights three key barriers that policy makers must anticipate and prepare for well in advance. First, the magnitude of the existing permit price differences would imply substantial reallocation of abatement efforts and sizable financial transfers, which will be difficult to sustain from a political economy perspective. Second, linkages between systems featuring absolute and intensity targets on the one hand and operating at subnational and national levels on the other hand will be more challenging to negotiate and implement. Third, any given market's core features must be shielded from political interference to establish a track record as a credible partner posing minimal regulatory risk in a potential linkage. To facilitate mutually beneficial linkages in the future, this chapter recommends that policy makers in the region start the dialogue with one another early but also actively participate in the ongoing United Nations Framework Convention on Climate Change (UNFCCC) efforts to flesh out the mechanisms supporting the implementation of Article 6 of the Paris Agreement. Finally, it is essential that all stakeholders in the region draw on the lessons learned from the successful linkages emerging around the globe.

BARRIERS TO LINKING CARBON MARKETS IN NORTHEAST ASIA

Barriers that may slow down or even stop the process of carbon market integration through linking come in various shapes and sizes. Some are particularly relevant in the Northeast Asian context, while others apply more generally. Efforts to overcome such barriers are economically and politically costly.

These costs as well as the many economic, environmental, and strategic benefits of linking carbon markets in China, Japan, and Korea are the subject of this chapter.[1] Crucially, neither the benefits nor the costs of linking are distributed evenly across and within the countries. Therefore, it is crucial that policy makers anticipate the barriers well in advance and consider their response options carefully.

ECONOMIC BARRIERS TO LINKING

Carbon markets give companies an economic incentive to adjust their emissions. The incentive is provided by the price at which companies can obtain emissions permits (sometimes called allowances) in the primary, secondary, or derivatives markets, which in turn must be surrendered to the government for compliance.

Many factors and complex interactions between them determine the day-to-day movements in the permit price. The average level of the permit price, however, is determined by the actual and perceived scarcity of permits, which is controlled by the policy maker through the number of permits and other means made available to companies for compliance (sometimes called their compliance obligations). For example, fewer permits and offsets imply a higher price on average because companies are required to deliver greater and costlier emissions reductions.

Permit Price Differences in Autarky

Any difference between average pre-linking permit prices, also known as autarky prices, presents both an opportunity and several challenges. It is an opportunity because linking the two markets will eliminate the price differential as abatement effort is reallocated. In turn, this implies the aggregate emissions reductions are achieved at a lower cost than would be the case if the markets were not linked. Typically, both countries stand to gain from these cost savings.

On the flipside, these mutually beneficial cross-border permit transactions imply financial transfers from permit buyers to sellers that are located in different countries. This may be politically unpalatable. The relocation of abatement effort across borders also implies the redistribution of the co-benefits of abatement, such as reduced local pollution, greater learning-by-doing in abatement activities, improvements in energy security, and so on.

The equalization of permit prices creates a more level playing field for international trade between the two countries and as they compete in third-country markets. It also creates winners and losers located potentially in different countries. There are no simple mechanisms through which those who gain can compensate those who lose even when changes in the trade patterns induced by carbon market linkage generate net benefits in aggregate.

Moreover, the decision to link carbon markets may well interact with a country's decision regarding the stringency of its cap. In particular, there is a chance that countries that expect to be net sellers of permits in a future linked market will strategically inflate the number of permits they issue today. This could imply greater emissions when markets are linked relative to the case when they operate in isolation.[2] Even when the number of permits can be shielded from such strategic manipulation, there may be post-linking incentives to relax monitoring and enforcement in countries that expect to be net sellers.

Market Design Differences

No two carbon markets are identical, and market design features that are desirable in one setting may be ill-suited elsewhere. By linking its market, a country is exposed to the design choices of its partners. Indeed, an argument of revealed preference suggests that if a country has chosen feature X over a potential linking partner's choice of the alternative feature Y, it is because X must be preferable given the country's circumstances and objectives. Linking can imply that consequences of both X and Y will be experienced in both countries.

The determination of the emissions target in a given year, a core design feature of any carbon market, is a case in point. An absolute target imposes a mass-based limit on the total emissions and issues a fixed number of permits accordingly. An intensity target specifies a rule that determines the total number of permits based on a yet-to-be realized variable. Both approaches are found in Northeast Asia, as discussed later. Economic theory and differences among existing carbon markets suggest country-specific economic characteristics (e.g., the level, volatility, and correlation of economic output and emissions) may render an absolute target in one country desirable, while an intensity target is preferred elsewhere.[3] When linked, the increase in emissions uncertainty of the country with the absolute target may be unacceptable, perhaps to the extent that it precludes linking.

A similar barrier to linking arises if the markets' cost containment mechanisms differ in the countries contemplating a linkage. These can include whether banking and/or borrowing is permitted and if so to what extent; emissions reserves; price controls such as price ceilings, floors or collars, and offsets. Consider, for example, the case of two markets where price collars are in place to prevent large fluctuations in permit prices. For the sake of argument, suppose one country is more comfortable with permit price variability and that this is reflected in a broader range for the price collar that, in particular, contains the partner country's entire price collar range. In this simple but extreme case, the unrestricted linking of the two carbon markets implies that the broader price collar becomes irrelevant—a development that may not be welcome in the country that apparently prefers that the markets, rather than the price collar, determine the permit price.

Anti-leakage provisions in the form of freely allocated permits, and the method by which they are allocated, are already among the most controversial elements of carbon market design in practice. In a similar vein, negotiations with domestic stakeholders regarding the source, type, and quantity of offsets that are allowed into the market to retire obligations can be contentious. Both leakage and offset provisions affect the level and distribution of economic rents captured by different stakeholders. Linkage implies both a rescaling and a redistribution of these rents. As such, it will be contested, which may present a significant stumbling block for the linkage process.

Differences in economic structure, stages of development, and shock resilience between countries can be important in determining the scale of the barriers to carbon market linkage.

Countries contemplating carbon market linkages should also share a common understanding regarding other carbon market design features. These include each country's approach to permit auctions and the use of the revenues from those auctions; measurement, reporting, and verification processes; operation of allowance registries; dispute resolution procedures; and length of trading and compliance periods. Relative to differences in target type, cost containment mechanisms, anti-leakage and offset provisions, one would expect countries to find common ground more easily along these dimensions.

Persistent Differences

As a policy instrument, a carbon market exists in, and interacts with, a complex economic system. A plethora of formal and informal institutional arrangements between the key actors in the country regulates this economic system. Together with historical events and the country's natural and human resource endowments, these arrangements determine the structure of the country's economy, its level of development, and its resilience to withstand domestic and international shocks.

Differences in economic structure, stages of development, and shock resilience between countries can be important in determining the scale of the barriers to carbon market linkage. These variables tend to be particularly persistent over time and difficult for governments to steer in the short to medium run. For example, the demand for permits in an advanced country where most of the gross domestic product is generated in the tertiary sector will behave very differently compared to permit demand in a developing country where the secondary sector is growing rapidly and the country's physical infrastructure, including its energy system, is being built. In addition, countries may have varying degrees of government intervention in the economy, reflecting divergent levels of comfort and experience with markets as the primary mechanism for allocating real and financial resources. They may have different track records in running a carbon market. Loosely speaking, the more dissimilar countries are along these dimensions, the higher the barriers to linking are likely to be.

Conversely, the costs associated with these barriers may prove more manageable for a group of countries with long-standing close international trade and financial ties. Such countries can more easily adapt and extend existing arrangements to also cover carbon market linkages, having over the years built the organizational, institutional, and legal infrastructures that underwrite their economic ties. However, such familiar relationships can at times be accompanied by historical animus and traditions of strategic competition and friction, even in the context of close trade ties. Relationships in Northeast Asia present both sides of this coin.

To summarize, this section highlights three classes of economic barriers to linking. Based on economic considerations alone, it would appear straightforward to confront the barriers arising due to the differences in average autarky prices and in market design. They are, after all, under the direct control of policy makers. On the other hand, barriers due to differences in the maturity of their emissions trading systems, levels of development, and economic structure are harder to grapple with. Policy makers can only influence rather than fully drive these variables. As I argue in the next section, political barriers may confound the problem.

POLITICAL BARRIERS TO LINKING

A domestic carbon market is one of many instruments that can deliver emissions reductions. Moreover, delivering emissions reductions with the aim of contribution to global climate change mitigation efforts is one of many climate policy goals that a government may wish to achieve with its carbon market. The government may also wish to achieve reductions in domestic emissions, incentivize low carbon investment as well as research and development, raise auction revenues, reduce other proximate pollutants, or pave the way for a more equitable distribution of the burden of domestic climate policy on society. While an appropriately designed carbon market can deliver emissions reductions and, at the same time, make a substantive contribution to the achievement of these other goals, linking it with another carbon market or markets may create tensions between goals.

The previous discussion surrounding differences in average autarky permit prices suggests price differences are at the core of the gains from linking. These gains are realized when prices across markets are equalized. Note, however, this implies that the price in one country must decline while it increases in another.

In the country where the permit price declines, *domestic* emissions increase but the price of energy-intensive goods, especially power, may decline. The price signal guiding financial, physical, and human capital toward low carbon investment and innovation is attenuated within the country but enhanced in its partner. Moreover, the volatility of the permit price, an important determinant of investment in principle, may decline in one or both countries. Nonetheless, the country can benefit from the enhanced research and development efforts of its partner because knowledge ultimately is a public good.

In addition, the auction revenues the government collects may decline as the permit price decreases, but the decline in price may be more than compensated for if the country increases the number of permits it auctions because price equalization creates a more level playing field. Finally, the distribution of the policy burden is altered relative to autarky with a new set of winners and losers. Put differently, the country takes a step forward toward some policy goals while moving away from others.

Economic analysis is of little help in this respect, because it is often difficult to identify how a government prioritizes its policy goals. Moreover, minimum acceptable levels for the economic welfare of certain groups, for environmental quality, and for energy security place important constraints on the government's choices and are likely to be important. An incumbent government will also be concerned with implementing policies that will increase its chance of staying in power. In other words, it faces a reelection constraint. Finally, a government may view carbon market linkage as a political goal worth pursuing by itself or as a part of its broader domestic or international agenda, but it may or may not be able to expend the necessary political capital to see it through.

Another aspect of the problem that may prove politically unpalatable for the government is that, by linking, it may in effect cede control over some aspects of its domestic carbon market policy to a foreign government. As discussed earlier in this chapter, the domestic government's position on market design features, such as cost containment mechanisms, may be rendered irrelevant under linking as its partners' choices may propagate across. Even when these changes to domestic policy parameters are welfare enhancing individually and in aggregate, the apparent foreign control of what was once a domestic matter may be difficult to sustain.

Linking also exposes countries to regulatory risks elsewhere. For example, after the linking arrangement is operational, a partnering government may decide to unilaterally impose fees or quotas on cross-border permit transactions, provide exemptions to previously regulated entities, or terminate the arrangement.[4] These opportunistic behaviors underline the importance of having an independent dispute resolution forum in place, which may prove difficult to implement if there are historical animosities or current regional rivalries between the countries.

OVERCOMING BARRIERS IN THE NORTHEAT ASIAN CONTEXT

How are these economic and political barriers manifested in Northeast Asia and, more importantly, can they be overcome? By now, China, Japan, and Korea have substantial experience with carbon markets.[5] In China, this experience derives from several subnational pilot carbon markets going back to 2013. These markets deliberately differ in design with a view to building the knowledge base for a robust national system that came into existence in early 2018. The Japanese carbon markets in Tokyo and

Saitama have operated since 2010 and 2011, respectively, and are linked with each other. For more than three years, Korea has operated a national market that is now in its second phase. While the countries' experiences with domestic emissions trading will no doubt be helpful for potential linkages in the future, the cross-country differences along the dimension highlighted earlier can present significant challenges.

Even though China, Japan, and Korea have no near-term plans to link their carbon markets, it is illustrative to consider the hypothetical case of immediate and unrestricted linking of their markets as a thought experiment. Roughly speaking, the aggregate cap in the existing pilots in China is about twice as large of that in Korea, which in turn is several times larger than that in the Japanese systems. Moreover, the recent prices in the Chinese markets were significantly lower than those in Japan and Korea. Taken together, these suggest that in the hypothetical case under consideration, regulated entities in Korea and Japan will acquire permits from China, and will have to reduce their emissions more than they would have under autarky. This has several effects including potentially large financial transfers to, and higher compliance costs in, China, as well as greater domestic emissions but lower carbon prices in Korea and Japan.

Roughly speaking, the aggregate cap in the existing pilots in China is about twice as large of that in Korea, which in turn is several times larger than that in the Japanese systems.

Of course, the hypothetical case would not take hold in this precise form. It would be difficult, if not impossible, to negotiate a link between the existing *subnational* markets in China and Japan and the national market in Korea. While China is well on its way to implementing a mandatory national market with what is essentially an intensity target, a mandatory national market is currently not a priority in Japan, and Korea has opted for an absolute target. The existing markets differ substantially in the sectors they regulate with Korea's market covering most economic sectors, while those in Japan exclude the emissions of power and transport sectors.

The priorities of the governments in China, Japan, and Korea also differ widely. The countries are at different stages of economic development. In China, economic growth and poverty reduction continue to be paramount, but concerns over income distribution and worsening environmental quality have gained increasing prominence. Japan is an advanced economy but faces many challenges in maintaining the high standard of living of its aging population while improving its energy security in a post-Fukushima world where its options are limited. Korea has transformed itself from a poor, war-ravaged country in the 1950s to the modern industrialized nation it is today but has to address the legacy of a large carbon- and energy-intensive industrial sector. International trade is central for each country's economic strategy. They compete intensely in one another's markets as well as in third countries to gain market share. Their climate change policies reflect these goals, and future carbon market cooperation will imply trade-offs between them. The countries' historical animosities as well as the delicate and ever precarious relationship each has with North Korea present further challenges. Indeed, the slow progress of the linkage negotiations between the carbon markets of the EU and Switzerland suggests that issues that are not directly related to carbon market integration can significantly hamper their progress nonetheless.

HOW TO OVERCOME THE BARRIERS

The key to reaping the many economic, environmental, and strategic rewards from linking carbon markets is to anticipate the barriers well in advance. By now, there are several real-world instances of linking to draw lessons from.[6] These include the formation and growth of the Regional Greenhouse Gas Initiative (RGGI) in the United States and the roller coaster relationship the state of New Jersey has had with it; the joint design and smooth operation of the linkage between the state of California and the province of Québec under the Western Climate Initiative (WCI), which recently integrated the province of Ontario without a significant hiccup; and the long and arduous path to the linking agreement between the EU and Switzerland, which is yet to be ratified at the time of writing. China, Japan, and Korea can and should capitalize on the experiences of these markets. Japan's knowhow gained in its linked markets can also be extremely helpful in this context.

The key to reaping the many economic, environmental, and strategic rewards from linking carbon markets is to anticipate the barriers well in advance.

Starting the conversation now, that is, years in advance of a link being operational, will go a long way in aligning the key parameters (e.g., stringency of the cap) and design features (e.g., cost containment mechanisms) of the markets early on or, failing that, enable the countries to establish a mutually acceptable timetable for doing so in the future.[7] The barriers to linking would be minimized if, in particular, this conversation yielded a plan for China to move from an intensity-based system to a mass-based system, for Japan to expand its city-level and voluntary carbon markets to a mandatory national market, and for Korea to eliminate the policy and regulatory uncertainties that have plagued its carbon market during the early years of its operation.

Moreover, the regional partners may find it beneficial to approach linking gradually. It may, for example, be less costly to link two markets first and add other regional partners later, much like in the broadly successful case of the WCI. This could reduce the challenges associated with negotiating complex agreements multilaterally and allow those with new carbon markets to gain experience and establish a track record domestically first.[8]

Alternatively, or simultaneously, restricted linking options may be considered during a transition period to full linkage.[9] Quantitative limits or taxes on cross-border permit trade, much like the quotas and tariffs in the international trade of goods and services, can be implemented. Exchange or discount rates that adjust the compliance value of permits by origin and/or destination may also be used to constrain linking options to a range in which the economic and political costs of linking are manageable.

The restricted linking options come with a health warning, however; by constraining what would otherwise be mutually beneficial permit trades, they diminish the gains from linking. The history of international trade in goods and services also provides countless instances where restrictions in the form of tariff and non-tariff barriers end up costing society dearly. For example, the import substitution policies, which were popular in Latin America and elsewhere, failed to nurture the so-called infant industries into engines of growth.[10] Any restrictions on trade also create welfare losses for the society as well as vested interests resisting their eventual removal.[11] In recent decades, these restrictions have primarily taken the form of non-tariff barriers that present unique challenges.[12] These barriers, including quantitative restrictions, rules of origin, and standard-like measures, may be particularly relevant for restricted linkages between carbon markets.

On a more positive note, there is increasing empirical evidence suggesting that the competition implied by increased participation in international markets for inputs and outputs improves the productivity of firms.[13] In brief, the main message from the international trade literature is that countries contemplating restricted linking options during a transitional period would be well advised to agree on a clear and renegotiation-proof exit strategy right at the start.

Article 6 of the Paris Agreement sets out general principles regarding the voluntary use of internationally transferred mitigation outcomes (ITMOs) toward the implementation of the Parties' nationally determined contributions. It also creates a mechanism to govern the cross-border movement of ITMOs among the Parties to ensure the environmental integrity of the system.[14] It is essential that the countries from the region participate actively in the ongoing negotiations to flesh out this mechanism. The negotiations are likely to provide a valuable forum for knowledge exchange between those who have established carbon market linkages and those who are aiming for them in the future.

It is not a forgone conclusion that linkages will go ahead, even when they are mutually advantageous to all participating countries.

To the extent that the Parties to the Paris Agreement believe the mechanism that ultimately emerges from these negotiations is fair, effective, and mutually beneficial, it may facilitate linkages among the countries of the region. At the same time, it will create a clear path to further integration when the region's linked carbon markets consider linkages with clubs of carbon markets emerging elsewhere, or with countries where alternative climate policy instruments are being deployed.[15] This would constitute an important step toward the economist's Holy Grail, a globally uniform carbon price.

CONCLUDING THOUGHTS

Cost-effectiveness of climate change efforts will become increasingly important as policy ratchets up under the Paris Agreement. Carbon market linkages provide a powerful tool to deliver cost-effectiveness as well as other environmental and strategic benefits. Yet it is not a forgone conclusion that linkages will go ahead, even when they are mutually advantageous to all participating countries. Anticipation of economic and political barriers to linkage well in advance is crucial. Epistemic communities have an important role to play to dispel myths about linking but also to underline the real challenges that must be confronted head on. The best way to do this is by building a comprehensive and robust evidence base that documents the potential benefits of and barriers to linking carbon markets, both ex ante and ex post. While there is a growing body of primary academic research and policy literature on the topic, several unanswered questions remain. Many others will emerge as linked markets mature and new linkages are formed. Against this backdrop, it is essential to maintain an active and open dialogue between the members of the research community, carbon market practitioners, and policy makers.

ENDNOTES

[1] For an overview of benefits and costs of linking in a broader context, see Christian Flachsland, Robert Marschinski, and Ottmar Edenhofer, "To Link or Not to Link: Benefits and Disadvantages of Linking Cap-and-Trade Systems," *Climate Policy* 9, no. 4 (January 1, 2009): 358–72, https://doi.org/10.3763/cpol.2009.0626; Jessica F Green, Thomas Sterner, and Gernot Wagner, "A Balance of Bottom-up and Top-down in Linking Climate Policies," *Nature Climate Change* 4 (November 26, 2014): 1064, http://dx.doi.org/10.1038/nclimate2429; Adam Rose et al., "Policy Brief—Achieving Paris Climate Agreement Pledges: Alternative Designs for Linking Emissions Trading Systems," *Review of Environmental Economics and Policy* 12, no. 1 (February 1, 2018): 170–82, http://dx.doi.org/10.1093/reep/rex029; Baran Doda, Simon Quemin, and Luca Taschini, "Linking Permit Markets Multilaterally," Grantham Research Institute Working Papers, 2018, http://www.lse.ac.uk/GranthamInstitute/publication/a-theory-of-gains-from-trade-in-multilaterally-linked-etss/

[2] Carsten Helm, "International Emissions Trading with Endogenous Allowance Choices," *Journal of Public Economics* 87, no. 12 (December 1, 2003): 2737–47, https://doi.org/10.1016/S0047-2727(02)00138-X.

[3] Richard G. Newell and William A. Pizer, "Indexed Regulation," *Journal of Environmental Economics and Management* 56, no. 3 (November 1, 2008): 221–33, https://doi.org/10.1016/J.JEEM.2008.07.001.

[4] William A. Pizer and Andrew J. Yates, "Terminating Links between Emission Trading Programs," *Journal of Environmental Economics and Management* 71 (May 1, 2015): 142–59, https://doi.org/10.1016/J.JEEM.2015.03.003.

[5] For an overview of the characteristics of carbon markets in the region, see Jackson Ewing, "Roadmap to a Northeast Asian Carbon Market Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, https://asiasociety.org/sites/default/files/RoadmapNortheastern-final-online percent2B.pdf; William A. Pizer and Xiliang Zhang, "China's New National Carbon Market" (working paper 19-01, Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, NC, January 2018), https://nicholasinstitute.duke.edu/sites/default/files/publications/ni_wp_18-01_0.pdf.

[6] For a broad stocktake of experience with linking, see Matthew Ranson and Robert N Stavins, "Linkage of Greenhouse Gas Emissions Trading Systems: Learning from Experience," *Climate Policy* 16, no. 3 (2016): 284–300, https://doi.org/10.1080/14693062.2014.997658.

[7] Dallas Burtraw et al., "Linking by Degrees: Incremental Alignment of Cap-and-Trade Markets," *SSRN Electronic Journal*, 2013, https://doi.org/10.2139/ssrn.2249955.

[8] Michael Mehling and Benjamin Görlach, "Multilateral Linking of Emissions Trading Systems" (working paper 2016-009, Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology, Cambridge, MA, April 2016), http://ceepr.mit.edu/files/papers/16-009.pdf.

[9] Lambert Schneider et al., "Restricted Linking of Emissions Trading Systems: Options, Benefits, and Challenges," *International Environmental Agreements: Politics, Law and Economics* 17, no. 6 (December 10, 2017): 883–98, https://doi.org/10.1007/s10784-017-9370-0.

[10] Mauro Rodrigues, "Import Substitution and Economic Growth," *Journal of Monetary Economics* 57, no. 2 (March 1, 2010): 175–88, https://doi.org/10.1016/j.jmoneco.2009.12.004.

[11] Anne O. Krueger, "The Political Economy of the Rent Seeking Society," *The American Economic Review* 64, no. 3 (1974): 291–303, https://doi.org/10.2307/1808883.

[12] Jaime de Melo and Ben Shepherd, "The Economics of Non-Tariff Measures: A Primer" (working paper P212, Fondation pour les Études et Recherches sur le Développement International, Clermont Ferrand, France, February 2018), http://www.ferdi.fr/sites/www.ferdi.fr/files/publication/fichiers/p212-ferdi-shepherd_and_melo_1.pdf.

[13] Hiroyuki Kasahara and Joel Rodrigue, "Does the Use of Imported Intermediates Increase Productivity? Plant-Level Evidence," *Journal of Development Economics* 87, no. 1 (August 1, 2008): 106–18, https://doi.org/10.1016/J.JDEVECO.2007.12.008; P. K. Goldberg et al., "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India," *The Quarterly Journal of Economics* 125, no. 4 (November 1, 2010): 1727–67, https://doi.org/10.1162/qjec.2010.125.4.1727; Hiroyuki Kasahara and Beverly Lapham, "Productivity and the Decision to Import and Export: Theory and Evidence," *Journal of International Economics* 89, no. 2 (March 1, 2013): 297–316, https://doi.org/10.1016/j.jinteco.2012.08.005; László Halpern, Miklós Koren, and Adam Szeidl, "Imported Inputs and Productivity," *American Economic Review* 105, no. 12 (December 2015): 3660–3703, https://doi.org/10.1257/aer.20150443.

[14] Michael A. Mehling, Gilbert E Metcalf, and Robert N Stavins, "Linking Climate Policies to Advance Global Mitigation," Science 359, no. 6379 (March 2, 2018): 997 LP-998, http://science.sciencemag.org/content/359/6379/997.abstract.

[15] Michael A. Mehling, Gilbert E Metcalf, and Robert N Stavins, "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)" (discussion paper ES 17-6, Harvard Project on Climate Agreements, Belfer Center for Science and International Affairs, Harvard Kennedy School, Cambridge, MA, October 2017), https://www.belfercenter.org/sites/default/files/files/publication/mehling-metcalf-stavins-final171019-1020.pdf.

REFERENCES

Bodansky, D. M., Hoedl, S. A., Metcalf, G. E., & Stavins, R. N., “Facilitating Linkage of Climate Policies through the Paris Outcome,” *Climate Policy* 16, no. 8 (2016): 956–972, https://doi.org/10.1080/14693062.2015.1069175.

Doda, B. and Taschini, L., “Carbon Dating: When Is It Beneficial to Link ETSs?” *Journal of the Association of Environmental and Resource Economists* 4, no. 3 (2017): 701–730, https://doi.org/10.1086/691975.

Doda, B., Quemin, S., and Taschini, L. “A Theory of Gains from Trade in Multilaterally Linked ETSs,” GRI Working Paper (No. 275) (2017), www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2017/09/Working-Paper-275-Doda-et-al-1.pdf.

Keohane, N., Petsonk, A., and Hanafi, A., “Toward a Club of Carbon Markets,” *Climatic Change* 144, no. 1 (2017): 81–95, https://doi.org/10.1007/s10584-015-1506-z.

Tuerk, A. (Ed.), “Linking Emissions Trading Schemes” [Special Issue], *Climate Policy*, 9, no. 4 (2009), https://www.tandfonline.com/doi/pdf/10.3763/cpol.2009.0665.

7. Political Economy of Carbon Market Cooperation in Northeast Asia

SUH-YONG CHUNG

INTRODUCTION

SINCE THE PARIS AGREEMENT ENTERED INTO FORCE IN 2016, expectations have been growing regarding new cooperation methods in the field of climate change, including the establishment of a regional carbon market in Northeast Asia.[1] Unlike the Kyoto Protocol, which assumes regional cooperation mainly in the context of implementing legally binding obligations to jointly reduce greenhouse gas (GHG) emissions, the Paris Agreement opens up new opportunities for countries to cooperate on the development and implementation of low carbon development action plans in the region. In this context, the establishment of a regional carbon market in Northeast Asia should also be actively pursued.

This chapter first seeks to analyze the conditions for establishing a carbon market in Northeast Asia by focusing on the implications of Article 6 of the Paris Agreement (which itself is described in greater detail in chapter four of this volume)[2] and the growing possibility of cooperation on climate change at the regional level. Second, this paper argues that it is important to develop political readiness for any Northeast Asian carbon market by demonstrating the importance of developing common interests in the renewable energy and forest sectors, and it theorizes that a carbon market could be a method of realizing such common interests. Finally, this chapter examines technical readiness for a Northeast Asian carbon market, focusing on the possibility of creating one or more Article 6.2 mechanisms at the regional level and the potential linkage of domestic emissions trading systems (ETSs) into a combined regional one.

For the purposes of this chapter, the term "carbon market" refers to various types of market mechanisms that seek to facilitate the implementation of climate change policies and achieve the objectives of the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. It may include ETSs and other forms of market mechanisms relying on market principles. While it would be ideal for any proposed carbon market to be consistent with the scope and aim of the Paris Agreement, specifically the rules laid out in Article 6, it may be possible for a carbon market to be used for purposes other than the implementation of climate change action plans under the Paris Agreement. Theoretical linked ETSs, which serve only to facilitate the trading of credits and not to implement nationally determined contributions (NDCs), are not within the scope of this chapter.

Rather, this chapter looks for cooperative market-based approaches for Northeast Asia by considering broader political and technical contexts. Rather than becoming mired in short-term debates and policy negotiations on linking domestic cap-and-trade systems, Northeast Asian countries can collaborate on clean energy and land-based climate mitigation projects and share emissions reduction values for these efforts through Paris Agreement mechanisms. These approaches are more likely to be politically palatable in Northeast Asia in the near term and can set the foundation for further cooperation such as linking ETSs in the future.

CONTEXT

Article 6 of the Paris Agreement as the Guideline for a Regional Carbon Market

The regime of Article 6 of the Paris Agreement has become an important element to consider regarding carbon markets.[3] Under the Kyoto Protocol, the market mechanism has been used as a complementary tool to facilitate the implementation of Annex I countries' obligations to reduce GHGs while ensuring the sustainable development of non–Annex I countries. As developing countries are not under any legally binding obligation to reduce GHGs under the Kyoto Protocol, offset mechanisms that do not necessitate direct action by developing countries to reduce GHGs emissions have been a popular option between the two country groups.[4] ETSs, in contrast, have been used by some of the Annex I countries, mainly at the regional and domestic levels. Among the Annex I countries, ETS linkages between different jurisdictions were made on an exceptional basis, such as in the case of the EU-Norway linkage.

Under the Paris Agreement, market mechanisms are expected to be used significantly more often, as can be seen by the national plans on addressing climate change put forward by member countries of the UNFCCC. Developed and developing countries alike must now reduce GHG emissions by developing and implementing NDCs. To achieve these targets, roughly half of these countries have expressed a desire or intention to utilize international market mechanisms to assist in the implementation of their NDCs. In particular, developing countries can be expected to more actively take advantage of the international market mechanisms available to them when trying to reach voluntary emissions reduction targets relative to developed nations.

Indeed, the Paris Agreement introduces an innovative mechanism to promote the effective implementation of NDCs through its Article 6. Article 6 will play the role of an incentive mechanism for countries to effectively implement their NDCs by sharing the outcomes of GHG reduction projects among cooperating states. The Article 6 mechanisms may share some similarities to previous variants of market mechanisms under the Kyoto Protocol, but we should also expect some substantial differences. Existing market mechanisms such as the ETS and the Clean Development Mechanism (CDM) will undergo some change in terms of their functions and running modalities to best align with new rules under the Paris Agreement.

Article 6.1 stipulates general issues such as the importance of voluntary cooperation on implementation of NDCs, environmental integrity, and sustainable development. Article 6.1 emphasizes these as follows:

Parties recognize that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.[5]

Article 6.2 assumes voluntary cooperation between and among parties to share emissions reduction outcomes, that is, international transferred mitigation outcomes (ITMOs) to implement their nationally determined contributions. Article 6.2 does not, however, go into detail about how to transfer ITMOs from the host country to another country. Therefore, several possibilities may exist such as linkage between and among existing ETSs; bilateral or multilateral cooperation initiated and executed through bottom-up mechanisms such as Joint Crediting Mechanisms (JCMs), or similar mechanisms to be created under

Article 6.2; and multilateral mechanisms to be created and managed by international organizations such as the Carbon and Financing Club of the Global Green Growth Institute (GGGI), other similar mechanisms maintained by multilateral development banks, and/or heterogeneous linkages between disparate market mechanisms housed in different jurisdictions. Considering that member countries of the UNFCCC are still negotiating on detailed rules for Article 6 at the time of this writing, it is still not clear whether any dominant mechanism(s) will appear.[6] In any case, the focus of the mechanism laid out in Article 6.2 should not be about trading units but about sharing the outcomes of mitigation efforts.

Article 6.4 deals with the centralized mechanism utilized to generate credits/units. The market mechanisms that had been conceived under the Kyoto Protocol such as CDM and Joint Implementation (JI) may be considered model(s) for the Article 6.4 mechanism.[7] Similar to current mechanisms under the Kyoto Protocol, the Article 6.4 mechanism will be operated directly by the UNFCCC. Detailed rules on governance and elements of the mechanism need to be agreed to by countries while considering the lessons learned from the Kyoto mechanisms. Ultimately, the outcome of efforts to reduce GHGs by participating countries can also be shared between and among countries. In such cases, Article 6.2 will govern transferred outcomes as ITMOs.

Climate Change Cooperation in Northeast Asia

Northeast Asia consists of relatively few countries, yet the total volume of GHG emissions from the region accounts for more than 30 percent of the global total.[8] Naturally, region-wide cooperation on climate change may be counted as a viable option toward the implementation of the UN climate change regime.

Under the Kyoto Protocol, it was seen as almost impossible for Northeast Asian countries to consider cooperation with the goal of reducing GHG emissions at the regional level.

Unfortunately, under the Kyoto Protocol, it was seen as almost impossible for Northeast Asian countries to consider cooperation with the goal of reducing GHG emissions at the regional level. Under the Kyoto Protocol, Japan is the only country in the region that belongs to the Annex I group. China and the Republic of Korea (South Korea) along with Mongolia and the Democratic People's Republic of Korea (North Korea) as non–Annex I countries used to remain relatively free from taking on substantial GHG emissions reduction actions. In addition, the fact that China, Japan, and South Korea belong to different negotiation groups in G77 and China, the Umbrella Group, and the Environmental Integrity Group respectively, has posed further difficulties in achieving mutual ground for regional countries to cooperate in terms of reducing GHG emissions.

The unique geopolitical features of Northeast Asia are also a contributing factor to difficulties in working together on climate change. China's reluctance to bind itself to multilateralism, historical issues between/among the countries, and the impact of traditional security challenges such as the North Korean nuclear issue are just some of the reasons.

However, the Paris Agreement opened a new opportunity for Northeast Asia to cooperate on climate change. It encourages both developed and developing countries to create their own NDCs that prioritize the planning and implementation of a low carbon economy. Cooperation among the countries will provide more opportunities to realize low carbon growth among them. For example, there have already been positive signs of countries actively seeking to implement low carbon economic policies at the national level. In the case of China, for example, emphasis has been placed on development utilizing low carbon technology such as renewable energy, electric-powered vehicles, and fast train networks, which should help China reduce its GHG emissions, demonstrating the nation's active role in implementing the Paris Agreement. In this changing landscape, there is more room for the carbon market to play an increasingly important role in the region if it could provide incentives for the actors to engage in region-wide climate change cooperation.[9]

The Paris Agreement opened a new opportunity for Northeast Asia to cooperate on climate change.

Implications for a Carbon Market in Northeast Asia

A Northeast Asian carbon market has the potential to be an important policy tool not only to facilitate the implementation of domestic climate change policies but also to encourage cooperation among the regional states and other stakeholders on regional efforts to realize low carbon development and, as a result, realize their NDC commitments to reduce GHG emissions. For the role of a carbon market to be fulfilled at the regional level, existing efforts at the national and subnational levels need to be supplemented by efforts at the regional level, for example, the linkage of already existing ETS systems and/or the creation of a regional market mechanism. In any case, the rules of Article 6 will play a guiding role in developing and implementing the market mechanism(s) in the region by providing opportunities to share the outcomes of GHG emissions reductions.

POLITICAL READINESS FOR A CARBON MARKET IN NORTHEAST ASIA

In the context of the importance of article 6 of the paris agreement and the ever increasing possibility of regional cooperation on climate change, efforts to establish a Northeast Asian carbon market should be aligned with building political momentum to achieve regional low carbon development, as can be seen in the cooperation on renewable energy and forestry areas. In other words, a regional carbon market should be considered not only as the final objective to be achieved but also as a means of realizing the regional common interests of all countries involved.

The Regional Carbon Market as a Means of Promoting Shared Interests

Considerations of a regional carbon market can be politically sensitive.[10] In the case of linking ETSs, for example, it can raise some concerns such as setting supranational mandatory emissions caps and disclosing national information of a sensitive nature. To create a carbon market in Northeast Asia, emphasis should be given to designing it as a means of promoting common interests among the countries. As mentioned earlier, a regional carbon market under the Paris Agreement can be a tool for facilitating cooperation on a regional low carbon economy. Such a planned carbon market can facilitate the transition to large-scale, low carbon development projects, such as the mega scale of investments in renewable facilities, the building of regional infrastructure such as the proposed integrated electricity "super grid" regional transportation networks, and region-wide forest management. The carbon market functionally achieves these goals by allowing countries to share the mitigation outcomes of low carbon development projects thanks to the use of ITMOs. This will, in turn, also help regional countries meet their national targets regarding the reduction of GHG emissions. In the case of South Korea, the nation may participate in building mega renewable facilities in the desert areas of Mongolia, taking advantage of the use of ITMOs for implementing its NDC targets. Here, cooperation on renewable energy and forestry is essential.

The Carbon Market as a Means of Promoting Renewable Energy Cooperation

Massive energy consumption, especially of coal and oil, in the region has led to the situation where emissions of CO_2 and other GHGs in the region may not be able to be reduced in time to achieve the two-degree target under the Paris Agreement.[11] According to the NDCs put forward by China, Japan, and South Korea, they need to make further efforts through increasing cooperation with other countries. In this context, renewable energy cooperation through the construction of wind and solar power plants and the sharing of generated electricity through the regional super grid are solutions that must be actively pursued.

In fact, renewable energy cooperation in the region has often been considered in the recent context of the necessity of securing a sustainable energy supply. In 2017, President Moon Jae-in of South Korea agreed with President Vladimir Putin of Russia that the two countries would cooperate to build the Northeast Asian super grid. In addition, the leaders of China and South Korea discussed possible cooperation on connecting electricity grids in Northeast Asia during the occasion of President Moon's visit to Beijing. In Japan, SoftBank, which first proposed this regional idea in 2011 after the Fukushima accident, has played a leading role in these regional efforts by launching its new 50-megawatt wind farm in Mongolia's Gobi Desert. Considering that the potential electricity generation capacity in the desert area in Mongolia is more than the combined electricity generation capacity of China, Japan, and South Korea,[12] renewable energy cooperation seemingly becomes critical for securing sustainable energy.

Renewable energy cooperation through the construction of a super grid has been promoted not only in terms of sustainable energy but also in terms of overall reduction in GHG emissions.[13] In the case of South Korea, renewable cooperation in Northeast Asia can be better understood in the context of the energy transition 2030 policy, a policy that aims to increase domestic renewable energy usage to 20 percent of the national energy mix by 2030. This can also be understood as South Korea's effort to actively implement its national target to reduce GHG emissions. In other words, in a situation where it would conceivably be very difficult for Korea to achieve its goal of reducing GHG emissions by up to 37 percent relative to business-as-usual (BAU) levels by 2030 only through domestic implementation policies, securing a high-level renewable energy source from outside the peninsula will drastically increase the possibility of Korea meeting its emissions reduction goals.

If the Northeast Asian carbon market can provide additional opportunities for regional countries by allowing them to share mitigation outcomes through ITMOs, countries will surely support the development and implementation of a regional carbon market. Put simply, a regional carbon market based on Article 6 of the Paris Agreement could play a critical role in boosting region-wide low carbon projects, such as Northeast Asian renewable energy projects, as it will allow regional countries not only to realize low carbon development but also help them meet their targets of reducing GHG emissions according to their proposed NDCs.

Carbon Market and Forest Cooperation

Cooperation on forestry and land use is also extremely important in Northeast Asia. Until recently, "yellow dust" has been one of the most significant regional environmental problems.[14] Strong west winds in Northeast Asia carry yellow micro dust particles from the desert areas of northern China to other countries in the region.[15] Desertification as well as unsustainable agricultural policies have been identified as the main reasons for such Yellow Dust problems. To address this issue, active cooperation on planting vegetation in the desert areas, along with providing sustainable agriculture policies, has been practiced. Second, in North Korea, the forest sector was identified as a primary area for the country to address its own climate change problems. In its NDC proposal, North Korea assumes a combination of sustainable agriculture and low carbon energy policies to address problems stemming from the forestry sector. Third, the Siberian region has been recently suffering from region-wide forest fires. These fires have been attributed to increased temperatures resulting from climate change, and they release a massive amount of CO_2, which destroys local industry. Unless the issue of forest fires in Siberia is addressed, we should expect this issue to become a significant contributor to global warming as well as regional air pollution.

All three forestry and land-use cases in Northeast Asia demonstrate a strong need for effective cooperation in the context of addressing climate change in the region. As cooperation on these issues also requires a level of cooperation at the national level to achieve any tangible outcomes, there is a rapidly increasing need for efficient resource mobilization, including huge investments and the development of common climate change policies. As in the case of renewable energy cooperation, a regional carbon market could surely play an important role in ensuring the region has the necessary resources demanded for cooperation on climate change mitigation by being developed according to rules of the Paris Agreement.

In other words, further considerations on how to integrate relevant issues on reducing emissions from deforestation and forest degradation (as part of the UN REDD+ programme) under Article 5 of the Paris Agreement into discussions on Article 6 must be made quickly. In fact, the UNFCCC negotiations have been considering several options on how to link these two relevant and important issues in the context of Article 6. Furthermore, reforestation and other land-use issues also must be addressed in the UNFCCC regime.

TECHNICAL READINESS FOR A CARBON MARKET IN NORTHEAST ASIA

Once political readiness for the creation of a carbon market at the regional level is addressed, the establishment of a carbon market in the region can ultimately be achieved by meeting technical readiness requirements. Technical readiness should also be dealt with in accordance to the rules of the Paris Agreement.

Status of Carbon Markets in Northeast Asian Countries

Among the countries in Northeast Asia, China, Japan, and South Korea have introduced their own domestic carbon markets. While South Korea has developed a nationwide ETS covering most emission sectors, China introduced its nationwide ETS in 2017 based on its experiences in implementation of seven pilot programs as well as active participation in international offset markets through participating in CDM projects. Japan has not, as of yet, implemented its own nationwide ETS but rather two municipal-level ETSs. It does have extensive experience in developing international and domestic offset rules, however.[16] Other countries in the region including North Korea, Mongolia, and Russia have not shown any significant sign of interest in a regional carbon market to date.

China

In 2017, China introduced its nationwide ETS by focusing on the power sector after implementing pilot programs in five cities and two provinces based on its rich experiences in implementation of CDM projects. These seven pilot ETSs have made progress in the measurement, reporting, and verification (MRV) process largely due to the influence of National Development and Reform Commission (NDRC) and external organizations such as the World Bank's Partnership for Market Readiness (PMR). As China introduces its nationwide ETS, its carbon market has become the largest in the world. China will work on operationalizing the new national market until 2020 to ensure compliance, advancing its domestic MRV policies, ensuring appropriate ETS coverage, and aligning with other national climate policies.

Japan

Japan has developed various market-based mechanisms including its own Voluntary Emission Trading Scheme (JVETS), Advanced technologies promotion Subsidy Scheme with Emission Reduction Targets (ASSET), and the J-Credit System. In the case of ETSs, the Tokyo Metropolitan Government (TMG) launched its own ETS by covering 1,400 large-scale facilities and factories in the industrial and commercial sectors. By implementing various domestic market mechanisms, Japan has developed a strong domestic capacity in MRV and registry for trading. At the international level, Japan introduced the JCM with its partner countries. Through the JCM, not only the programs of Japanese and foreign firms but also government programs have been implemented through the JCM. Outcomes of JCM implementation projects will be shared by both relevant countries through the development of registries and may be used for the implementation of NDCs of each country. Once detailed rules for Article 6 of the Paris Agreement are finalized, the JCM may need to be revised according to the new global rules.[17]

Korea

When looking at the Northeast Asian region, we can say that South Korea has developed the most complete form of carbon market at the national level by launching its national ETS program in 2015. During the first phase of its ETS implementation, the scheme covers 525 large emitters; 68 percent of total emissions; and 23 sectors including steel, cement, petrochemicals, refineries, power, buildings, waste, and aviation. Further improvements planned for in the second phase of implementation include active participation in global carbon markets. In addition, if we consider its plan to use international market mechanisms to assist in the implementation of its NDC, we can assume that South Korea would show strong interest in making use of the mechanism to be governed and developed by Article 6 of the Paris Agreement.

Developing Regional Article 6 Mechanisms

One of the immediate options for Northeast Asia to consider is to create one or more viable mechanism(s) under Article 6.2 of the Paris Agreement, the text of the article assuming various types of voluntary mechanisms. The JCM is one such example, but as of yet there are no other mechanisms available under Article 6.2.

In Northeast Asia, countries may consider using JCM as a way of creating and sharing credits resulting from the implementation of low carbon projects in the region. If this is to be the case, countries must carefully consider how to participate in JCM projects. Countries can cooperate bilaterally or multilaterally depending on their own preferences, although a single multilateral JCM project may provide a more efficient means of cooperation. Regardless of structure, however, countries need to agree on how to share mitigation outcomes for the purposes of the implementations of individual NDCs. There is also a pressing need to carefully monitor against the risks of double counting, an issue that reared its head under the Kyoto Protocol, so that cooperating states can comply with environmental integrity standards according to the detailed rules of Article 6.[18]

Another option is to create a completely new regional mechanism under Article 6.2. Such an approach would, of course, also need to comply with rules on environmental integrity and double counting, while having the capacity to be used for the implementation of NDCs according to the Paris Agreement.[19] The establishment of strong governance among participating countries, clear guidelines on sharing mitigation outcomes, elimination of double-counting practices, and standardization in reporting and verification rules are technical elements that must all be prioritized in the development and introduction of any new regional mechanism under Article 6.2 of the Paris Agreement.

Linking ETSs

The regional linkage of domestic emissions trading schemes is a popular option in the context of creating a carbon market at the international level. The fact that China, Japan, and South Korea maintain their own schemes, albeit to different levels of completion, is an encouraging sign when considering ETS linkage as a possible option. On the other hand, considering the scale of the differences in the structure and scope of these systems, it could create complications regarding a regional ETS. Further potential linkages to the regional ETS, such as would be the case if Mongolia and North Korea were to link up as well, would further compound this issue. In any case, regional rules need to be agreed to by the countries involved on how to use linked ETSs for the purpose of implementing NDCs under Article 6 of the Paris Agreement. Otherwise, attempts to link ETSs will face serious challenges from those same countries. However, if ETS linkage is to be considered as a way of generating, sharing, and transferring mitigation units as ITMOs, then a range of technical elements on the type of linkage pursued, cap stringency, allocation rules, stability mechanisms, and monitoring and compliance approaches (among other issues) would need to be addressed.

CONCLUDING THOUGHTS

Considering the different situations among the countries in Northeast Asia in terms of types, scope, and role of carbon markets at the domestic level, it may not be immediately possible to have directly linked ETSs at the regional level. It may also be true that the existing mechanism developed by Japan, that is, the JCM, may not be used among the regional countries to build a regional carbon market. Therefore, Northeast Asia's own mechanism under Article 6.2 is the more viable option to develop a regional carbon market that will include linked ETSs at the later stage.

ENDNOTES

[1] Jackson Ewing and Minyoung Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, http://bit.ly/2FCAnzy.

[2] Suh-Yong Chung, "Status and Prospects for Article 6 of the Paris Agreement: Implications for Cooperation in East Asia," in *International Cooperation in East Asia to Address Climate Change*, eds. Robert N. Stavins, and Robert C. Stowe (Cambridge, MA: Harvard Project on Climate Agreements, 2018), 69–72.

[3] Sonja Hawkins, "Carbon Market Clubs Under the Paris Climate Regime: Climate and Trade Policy Considerations," *International Centre for Trade and Sustainable Development*, October 2016, www.ictsd.org/sites/default/files/research/carbon_market_clubs_under_the_paris_climate_regime.pdf.

[4] I-Hsuan Hong, Guillermo Alfonso Nápoles Rodríguez, Yi-Ju Chen, and Lukas Gandajaya, "Analysis on Affecting the Clean Development Mechanism (CDM): A Review," *International Journal of Electronic Business Management* 13 (2015): 45–56, ProQuest.

[5] UNFCCC, "Paris Agreement," 2015, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[6] UNFCCC, "Negotiations on Article 6 of the Convention," https://unfccc.int/topics/education-and-outreach/the-big-picture/education-and-outreach-in-the-negotiations.

[7] Karen Holm Olsen, Christof Arens, and Florian Mersmann, "Learning from CDM SD Tool Experience for Article 6.4 of the Paris Agreement," Climate Policy 18, no. 4 (2018): 383–395, https://doi.org/10.1080/14693062.2016.1277686.

[8] Adapted from Climate Analysis Indicators Tool (CAIT), World Resources Institute, "CAIT—Country Greenhouse Gas Emissions Data," April 2014, www.wri.org/resources/data-sets/cait-country-greenhouse-gas-emissions-data.

[9] Jackson Ewing, "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, https://asiasociety.org/sites/default/files/RoadmapNortheastern-final-online percent2B.pdf.

[10] World Bank, "Exploring East Asian Cooperation on Carbon Markets," June 16, 2016, www.worldbank.org/en/news/feature/2016/06/16/exploring-east-asian-cooperation-on-carbon-markets.

[11] Climate Action Tracker (CAT), https://climateactiontracker.org/countries/.

[12] International Renewable Energy Agency (IRENA), "Mongolia's Vast Renewable Energy Resources Can Power Sustainable Development," March 21, 2016, www.irena.org/newsroom/pressreleases/2016/Mar/Mongolias-Vast-Renewable-Energy-Resources-Can-Power-Sustainable-Development.

[13] Bryan Harris, "The Great Asian Super Grid, *Financial Times*, November 3, 2017, www.ft.com/content/e67a54e8-c09e-11e7-b8a3-38a6e068f464.

[14] See, for example, Julian Ryall, "True Grit: Clouds of Chinese Dust Descend on Southern Japan," South China Morning Post, May 9, 2017, www.scmp.com/news/asia/east-asia/article/2093573/true-grit-clouds-chinese-dust-descend-southern-japan.

[15] Xiaole Pan, Itsushi Uno, Zhe Wang, Tomoaki Nishizawa, Nobuo Sugimoto, Shigekazu Yamamoto, Hiroshi Kobayashi, Yele Sun, Pingqing Fu, Xiao Tang, and Zifa Wang, "Real-Time Observational Evidence of Changing Asian Dust Morphology with the Mixing of Heavy Anthropogenic Pollution," Nature, March 23, 2017, -www.nature.com/articles/s41598-017-00444-w.pdf.

16 For further analysis on these three markets, see Jackson Ewing and Minyoung Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, https://asiasociety.org/sites/default/files/2017-12/NextGen percent20Report percent20FINAL percent20WEB.pdf.

17 Kazuhisa Koakutsu, Aryanie Amellina, Alexis Rocamora, and Chisa Umemiya, "Operationalizing the Paris Agreement Article 6 Through the Joint Crediting Mechanism (JCM): Key Issues for Linking Market Mechanisms and the National Determined Contributions (NDCs)," Institute for Global Environmental Strategies (IGES), May 2016, https://pub.iges.or.jp/pub_file-228/download.

18 This may require JCM, which was developed under the Kyoto Protocol, to be modified to meet the rules under the Paris Agreement.

19 See Chung, "Status and Prospects for Article 6," 69–70.

8. Developing a Linkage-Ready Carbon Market: A View from China

XI LIANG

SUMMARY

THE EMISSIONS TRADING SYSTEM IS CENTRAL TO CHINA'S CLIMATE POLICY. In December 2017, the National Development and Reform Commission (NDRC) of China announced the kick-off of the development of a national ETS starting initially with the electricity sector. Linking of carbon pricing jurisdictions could, in theory, provide strong political momentum for emissions reductions and improve market efficiency. However, linkage is not yet a priority for emerging carbon markets including China's national ETS. Developing an ETS in linkage-readiness status would provide future opportunities for linkage while avoiding the "lock-in" effect of linking with other ETSs or carbon pricing jurisdictions in the near term. This chapter recommends how the design of China's ETS is compatible with international carbon markets[1] and proposes a framework with eight criteria for consideration in improving compatibility of China's national ETS design.

INTRODUCTION

The Paris Agreement reached in December 2015 sets out a global action plan to put the world on track to avoid dangerous climate change by limiting the global warming to well below 2°C above pre-industry levels in the longterm, and to pursue the best effort to limit the increase in warming to 1.5°C. To achieve this target, the Paris Agreement identified the need to peak global greenhouse gas (GHG) emissions as soon as possible and to undertake rapid reductions with the best available technologies.

The 2°C warming target could be translated into a 1 to 1.8 trillion ton carbon dioxide emissions budget (Allen et al., 2009); however, the risk of missing the target around 2040 to 2050 is quite significant taking into account the current global carbon dioxide emission trajectory. The Paris Agreement suggested a bottom-up approach in delivering the GHGs abatement effort. Article 6 of the Agreement provides the legal foundation for bilateral and multilateral joint efforts for climate actions, including cooperation on carbon pricing and market mechanisms.

Carbon pricing plays a central role for incentivizing emissions mitigation and encouraging investment in long-term emissions abatement. The cap-and-trade ETS is the most popular policy in pricing the external cost of carbon emissions. A properly functioning ETS can offer a cost-effective solution for achieving GHG reductions. The overall goal of an ETS is to minimize the cost of meeting a set emissions target or an emissions cap (Laing et al., 2013).

Linking carbon pricing systems could generate economic benefits for GHG reduction in multiple ways (Anger, 2008; Ewing, 2016), including the following three aspects: (1) efficiency gains, (2) liquidity gains, and(3) distributional impacts. In 2015, the Energy and Climate Change Committee (ECCC) of the United Kingdom (UK) Parliament recommended that a future international climate framework promoting the use of carbon markets and facilitating linking ETSs would be the most cost-effective way to reduce GHGs (ECCC, 2015).

However, the international linkage of China's ETS is not yet a priority on the policy agenda. The design of a major new carbon market needs to avoid the incompatibility with other carbon market or carbon pricing schemes. Pursuing linkage-ready designs increases the compatibility of a carbon pricing regime with potential future linking partners. The linkage-readiness designed ETS provides flexibility in linking with ETSs in other jurisdictions and therefore gains a competitive advantage to become a central ETS across jurisdictions in the longer term.

CHINA'S ETS DEVELOPMENT

In november 2011, China began seven pilot ETSs in Beijing, Chongqing, Shanghai, Shenzhen, Tianjin, Hubei, and Guangdong (NDRC, 2011). Among the seven provinces and cities, the Guangdong ETS (GD ETS) is currently the largest carbon market in developing countries. The GD ETS became operational on December 19, 2013. In 2014, the Chinese government announced a plan to establish a national carbon market in 2017. In December 2017, China announced the work plan for piloting the national ETS starting from the electricity sector. Setting up a national carbon market would ultimately require demonstrating partial linking of individual pilot carbon markets within China, as some compliance entities in the seven pilot ETSs will be included in the national ETS.

Since the December 2017 soft launch of the national ETS, Chinese authorities have continued to pursue market creation and early stage operationalization without compliance obligations for covered entities. This is likely to continue into 2020, at which point formal trading within the electricity sector will commence. In the years that follow, coverage is planned to expand to other sectors, and the possibilities of international linkage are set to be explored further.

PROPOSED LINKAGE-READINESS DESIGN FRAMEWORK

An ETS consists of a number of covered entities (industry participants as companies or installations), each of which will have an emissions cap (i.e., the limit on their total emissions set by regulators) over the compliance period (i.e., a specified period of time). In an ETS, participants subject to caps are required to either reduce their emissions to the level of the cap or, if they let their emissions remain above the cap, to buy emissionsallowances from other participants.

Emissions allowances could be centrally allocated through free allocation or auctioning to covered entities. Two potential allocation methods could be applied for free allocation: grandfathering based on historic emissions performance and benchmarking based on industry best practice. Participants can also choose to sell allowances if they can reduce emissions below the cap. The registration system takes the responsibility of issuing allowances, managing allowances, and implementing the compliance process. During the compliance process, each covered entity must hold allowances at least equal in number to its quantity of emissions. The outcome is that the total quantity of emissions will have been reduced to the sum of all capped levels. The value of a carbon allowance is driven by the quantitative limit (i.e., scarcity of allowances in the market).

TABLE 8.1. KEY MILESTONES OF CHINA'S ETS DEVELOPMENT

Oct. 2005:	NDRC, MOST, MOFA, and MOEP jointly started a management measure for CDM projects in China
Dec. 2009:	China commits to reducing national emission intensity by 40 to 45 percent in 2020 compared to 2009 at COP15
Aug. 2010:	State Council mentions plan to establish an ETS
Oct. 2010:	ETS is included in the 12th Five-Year Plan
Nov. 2011:	NDRC approves ETS pilots in 7 provinces and cities
Dec. 2011:	State Council clarifies steps to establish an ETS during 12th Five-Year Plan
June 2012:	NDRC indicates CCERs could be used as offsets in ETS pilots
Oct. 2013:	NDRC releases GHG accounting methods for 10 sectors
June 2013 to June 2014:	Seven pilot ETSs were launched
June 2014:	Establishing a national ETS is included as a work task of the government's Deep Economic Reform Group
Dec. 2014:	NDRC announces measures for establishing a national carbon market
May 2015:	State Council accelerates the construction of ecological concept in civilization
May 2015:	NDRC implemetation of constructing national carbon ETS
June 2015:	State Council strengthens climate change action-China's national independent contribution
Nov. 2015:	NDRC approves the publication of 11 national standards for MRV
Jan. 2016:	NDRC prepares for starting national carbon market work notice
March 2016:	NDRC application of regulations on administration of ETS to legislation
Nov. 2016:	NDRC "The 13th Five-Year plan" control of GHG program (2016-2020)
Dec. 2017:	NDRC kicks off the work plan for the national ETS, with an initial start from the electricity sector
2018:	Data collection for the electricity sector
2019:	Simulate operation in the electricity sector
2020:	Formal start of ETS in the elctricity sector

Source: Created by author from publicly available information: State Council of the People's Republic of China (PRC), 2010, 2011. National Development and Reform Commission (NDRC) of the PRC, 2005, 2011, 2012, 2013, 2014b, 2014c, 2015, 2016, 2017. Da Zhang, Valerie J. Karplus, Cyril Cassisa and Xiliang Zhang, "Emissions Trading in China: Progress and Prospects," Energy Policy 75 (2014): 9–16, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.697.4125&rep=rep1&type=pdf.

Compatible carbon market designs not only require similar prices and emissions targets but also harmonization of design features as part of linking negotiation (Carbon Trust, 2009). These features include allocation methodology; coverage; measurement, reporting, and verification (MRV); offset mechanism and new entrants (Hawkins and Jegou, 2014). A number of studies have been conducted for key elements in linking with case studies such as the Republic of Korea (hereafter, Korea) and EU ETSs (Hawkins and Jegou, 2014) and within China, such as how pilot ETSs evolved into the national ETS in China. Successful linkage between ETSs requires each system to coordinate the implementation of its program effectively with others. Therefore, linkage readiness refers to a high degree of compatible market design, including the capacity to coordinate the linked programs to maintain harmonization and to resolve differences that may arise in linkage, to enable cross-jurisdictional transfer of compliance instruments, and to jointly auction emission allowances. Vitally, not all design characteristics need to be fully harmonized for linking to take place,[2] but select harmonization and clear agreements on designs and processes are essential for these issues.

The evidence from the link between the California and Québec ETSs demonstrates the importance of preparing for the potential linkage at the system design stage. Substantial economic and political value would be extracted if China's national carbon market were designed in a linkage-readiness status, that is, key elements would be designed from the outset to be potentially compatible with the Korean ETS (KETS), Tokyo-Saitama ETS, EU ETS, California-Québec-Regional Greenhouse Gas Initiative (RGGI), and other major ETS systems.

Substantial economic and political value would be extracted if China's national carbon market were designed in a linkage-readiness status, that is, key elements would be designed from the outset to be potentially compatible with the Korean ETS (KETS), Tokyo-Saitama ETS, EU ETS, California-Québec-Regional Greenhouse Gas Initiative (RGGI), and other major ETS systems.

Building onto research into linkage-readiness efforts between the Guangdong and EU ETSs—where five ETS design factors for a linkage-readiness index were considered based on stakeholders' reviews and literatures—this chapter recommends key design elements for a linkage-readiness ETS. It should include flexibilities around the following eight factors:

- Setting an Emissions Cap
- Industry and GHG Coverage
- Consistent Regulation Point and Accounting of Emissions
- Allocation Methods
- Flexibility Mechanisms
- Measurement, Reporting, and Verification (MRV)
- Registry and Enforcement
- Legal, Regulatory, and Policy Environment

Setting an Emissions Cap

Harmonizing the emission reduction goals of different jurisdictions that have an intention to link, while still creating the same or better environmental benefits, is the central motivation for ETS alignment. The form of targetsetting—whether it is, for example, an intensity target (such as that used in the China national system) or an absolute target (such as in the KETS)– may influence the evolution of the emissions cap of such trading schemes in the future and the behavior of industries. Very different emissions targets of two regions hosting a carbon market could pose a significant challenge for negotiating a linkage (Burtraw et al., 2013).

The emissions cap is a key element to be considered in linking two emissions trading systems. How the emissions cap was initially determined is not important; however, how the emissions cap evolves over a time period is significant. The stringency of different emissions caps determines the demand and supply of emissions allowances. In theory, when the linkage method was based on a "1 ton allowance equal to 1 ton allowance" assumption, allowances would flow from a less stringent to a more stringent program until the prices of the two carbon markets were equal.

In practice, the interaction between cap and price could be more complicated. According to the experience of the California ETS in exploring a linkage with the EU ETS, the main barriers for linkage are less about stringent reduction targets and more about carbon price uncertainties in the EU ETS (Zetterberg, 2012), as an ambitious emissions reduction target may not translate into a higher carbon price, while very different carbon prices could pose equity concerns.

The ability to pass through prices in China may increase since the electricity market liberalization reform pilot has just started.

The cap of each ETS in theory is informed by the national emissions reduction target. Emissions of developing countries such as China and India will continue to grow with the potential to peak and decline in the distant future, while developed countries (mainly OECD economies) have already seen their emissions plateau and begin to decline (WBCSD, 2012). Therefore, unlike developed economies such as EU or California-Québec-Regional Greenhouse Gas Initiative (RGGI) ETSs that have emissions reduction targets in absolute value (tCO_2), the Chinese national and pilot emissions reduction targets are currently intensity based (i.e., measured by tCO_2/GDP).[3]

The compatibility of ETS designs in cap setting is not harmonizing the emissions growth target in the system. To facilitate linking ETSs, stakeholders from two jurisdictions need to agree the ambition of a commensurate emissions cap. To make an ETS design linkage ready, (1) the emissions cap-setting rule should be transparent and predictable in the future trading periods and (2) the market should provide external stakeholders to assess the abatement effort. The concept of "mitigation value"[4] could be applied to harmonize the difference in the emissions abatement ambitions, discussed in detail in section four.

Industry and GHG Coverage

The ETS coverage, including industry coverage, emissions coverage, and participation threshold, determines the entities covered for compliance purposes in the carbon market. Misalignment in ETS coverage when linking two ETSs could impact other elements and cause misallocation of allowances, carbon leakage, or distortion of competitiveness (Flachsland et al., 2009). Different types of covered GHGs could pose a barrier for full bilateral linkage. In the proposed Australia/EU ETSs linkage, Australia had intended to negotiate with the EU to add methane as a GHG for the linked emissions trading system, and the EU did not appear to oppose this extension. However, the ability to accurately monitor the additional GHG in a linked system and accounting of indirect emissions could be particularly challenging (Hawkins et al., 2014).

To achieve linkage-readiness status, (1) a carbon market should be designed in a flexible way so that the market regulator could change industry, emissions coverages, or the participation rules in response to requirements through the linkage negotiation process. In China, the participated entities are companies, but most of the other ETSs (e.g., in the EU and in the United States and Canada), the compliance entities are installations or projects. (2) Therefore, it is desirable for there to be a flexible provision in the ETS regulation that allows compliance entities to be redefined at the installation or the project level.

Consistent Regulation Point and Accounting of Emissions

In the Chinese seven pilot systems, the percentage of emissions covered is quite high. All of the Chinese pilot ETSs cover companies rather than emission sources from installation (Zhang, 2015). Covered entities are liable for direct emissions but also take into account downstream emissions if the energy source is electricity or heat (European Parliament, 2016). For example, a company in the steel sector would report both direct emissions in the process of burning fossil fuel but also the indirect emissions embedded in the electricity purchased from the grid. In that case, the emissions of the electricity generated for steel production are double counted in China's ETS, which Chinese authorities seek to control for through their cap setting (IETA, 2015). For a linkage-readiness design, this paper suggests that double counting should be eliminated in achieving a linkage-readiness status and only direct emissions should be accounted. In practice, China should consider separate indirect emissions from the national ETS and apply an alternative policy measure to incentivize indirect emissions reduction, such as the PuHui system (a public participation mechanism).[5]

On the other hand, in the EU, the cost incurred from the operation of the ETS can be passed through to consumers. China,however, cannot fully pass through the cost as the energy and other energy-intensive commodity prices are still influenced by the government; but the ability to pass through prices in China may increase since the electricity market liberalization reform pilot has just started. Thus, flexibility for changing the ETS's regulation point along the supply chain upstream and downstream is needed for linkage readiness.

Allocation Methods

Allocation methodologies (e.g., grandfathering and benchmarking) have a direct impact on an industry's competitiveness and can clearly show the difference in energy efficiency among compliance companies (Ecofys, 2014). Moreover, the percentage of free allowances allocated to covered entities influences the carbon price and market liquidity (Helm, 2003). Allocation is already complicated in a single ETS, and once set it would be operating for a number of years. Linking ETSs will involve sectors from two regions where allocations do not have to be identical but need to be carefully examined and recognized. For example, Norway has more free allowances allocated than in the EU ETS, but that did not impact the bilateral linkage, and there are also minor differences in the allocation mechanism between California and Québec.

Most ETS schemes started with free allocation to encourage industry participation and gradually lower the percentage of free allowances and move toward auctioning. The EU ETS has been running for 10 years, evolving from grandfathering to a benchmarking approach.[6] In Korea, the system began with free allowances with a predetermined schedule for pricing to be implemented. Earlier exploratory research on an EU-Guangdong ETS linkage considered that the difference in allocation methodology is the largest barrier in linking the two systems. To achieve linkage readiness, the carbon market should (1) ensure industry participants have transparent access to the current allocation methods and will be informed in advance about future changes in the methods; (2) develop a consistent and transparent rule for allocating reserved credit for new entrants in preparation for a bilateral linkage; (3) entities covered in different ETSs but in the same sector should be treated as equally as possible; and (4) implement and revalue allocation methodology in a fixed time-period based on business-as-usual (BAU) uncertainties and carry out sensitivity analysis including potential carbon leakage factor

Flexibility Mechanisms

Harmonizing the rules for using international offset credits is crucial before two carbon markets can be linked (Tuerk et al., 2009). A common pool for carbon allowances should be established after linkage (Hawkins and Jegou, 2014). To achieve linkage readiness, (1) provisions for the use of offset credits (including the percentage of offset credits allowed for compliance and the types of projects allowed for offsetting) should be flexible and amendable and (2) provisions for banking and borrowing should be flexible and amendable.

Measurement, Reporting, and Verification (MRV)

The robustness of the MRV system determines the success of a carbon market (Duan, 2014). China has already released reporting and monitoring guidelines for more than 10 sectors within the national carbon market. MRV systems differ across jurisdictions; therefore, (1) a provision to revise the MRV rules could provide flexibility for negotiations on linking ETSs. For a large-scale carbon market that is likely be the central in multilateral systems, a linkage-readiness ETS should desirably (2) adopt the most rigorous integrity rule in designing and implementing MRV and (3) an internationally agreed-upon carbon accounting standard, if there is any, should be applied.

> When it comes online in earnest, China's national ETS will be the largest such system in the world, making it a vital tool in its own right for addressing the global climate change challenge.

Registry and Enforcement

For cases of noncompliance, measures to enforce sanctions in China's pilot ETSs are relatively weak compared with the EU ETS or the California-Québec-Regional Greenhouse Gas Initiative (RGGI) ETS as the level of penalty is relatively low. To achieve linkage-readiness status, (1) there should be a flexible provision to allow the adjustment of penalties for noncompliance, and it is desirable for the ETS to (2) have flexibility to accommodate or participate in an international registration and clearance system.

Legal, Regulatory, and Policy Environment

Legal and regulatory readiness is critical for linking China's national ETS with other international ETS jurisdictions (see chapter three of this volume). The international legal foundation for international linkage is Article 6, Sections 1–7, of the Paris Agreement. There is no universal regulatory framework to govern the linked carbon markets without understanding the drivers of linkage and the types of linkages, that is, whether linkage is national, sectorial, or subnational (Zaman and Hedley 2016, 4, 26). Legal and regulatory provisions should be made to provide flexibility for linkage.

In addition, carbon pricing through an emissions trading system could be significantly affected by parallel energy and climate policies; for example, a feed-intariff policy could be translated into a much higher carbon price than that in the ETS. With a fixed emissions target set out by the nationally determined contributions (NDCs), stronger alternative energy and climate policies (such as tax schemes, renewable obligations, feed-intariffs, energy efficiency measures, closing down of coal-fired power plants) could lower the carbon price in an emissions trading system. Parallel to the piloting of a national emissions trading system, China is also piloting green certificate trading. For a linkage-ready ETS, regulators and market participants need to be able to interpret the pricing of carbon emissions whiletaking into account a portfolio of energy and climate policies.

CONCLUSION

When it comes online in earnest, China's national ETS will be the largest such system in the world, making it a vital tool in its own right for addressing the global climate change challenge. However, in the post–Kyoto Protocol world, it is...vital that major ETSs explore pathways for market linkage that can yield greater emissions reduction outcomes than those possible on their own. A top-down, global approach to carbon market cooperation is not forthcoming, and so adhoc, creative approaches to market linkage are—despite their complexity and myriad hurdles—the only realistic tool for finding significant market convergence. China will continue to loom large in this equation, and the architects of both the Chinese markets and those of its regional neighbors should set the foundation now for cooperative opportunities in the future. Linkage readiness is the key concept that will build this foundation, and the approaches extrapolated in this chapter offer pathways for its pursuit.

ENDNOTES

[1] Compatibility indicates that the carbon market design of China's ETS is harmonized with that of international carbon markets.

[2] Daniel M. Bodansky, Seth A. Hoedl, Gilbert E. MetCalf, and Robert N. Stavins, "Facilitating Linkage of Climate Policies Through the Paris Outcome," *Climate Policy* 16, no. 8 (July 2015): 956-972, https://doi.org/10.1080/14693062.2015.1069175; Michael A. Mehling, Gilbert E. Metcalf, and Robert N. Stavins, "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)," Faculty Research Working Paper Series, Harvard Project on Climate Agreements, September 16, 2017, https://scholar.harvard.edu/files/stavins/files/mehling-metcalf-stavins_linking_heterogeneous_climate_policies_consistent_with_the_paris_agreement.pdf.

[3] By 2020, the European Commission (EC) aims to reduce emissions to 21 percent lower than the base year 2005 and 43 percent lower by 2030. In 2013, the total number of allowances issued to the 28 EU members for fixed installations was more than 2 billion. In Phases I and II, EU ETS oversupplied allowances in the carbon market, and this oversupply will still be there although linearly decreasing by 1.74 percent of quantity of allowances issued annually from 2008 to 2012. The reducing allowances cap will be lowered to 2.2 percent from 2021, and 48 percent of allowances will be auctioned in the market. In China's 12th Five-Year Plan (FYP), the emissions reduction target was measured in carbon intensity per GDP. In 2020, China aims for reducing to 45 percent of the level of carbon emitted per GDP compared to 2005. In November 2014, in a joint statement with the United States, China announced a target to reach the peak of greenhouse gas emissions by 2030 (The White House, 2014).

[4] Direct emissions are measured in tce/t (products) and indirect emissions are measured in tce/MWh for power usage and there is an emission factor (tCO_2/tce) for fossil fuel.

[5] PuHui System is an incentive mechanism for citizens and small or macro enterprises to value energy saving and carbon reduction behaviors.

[6] A product benchmark is currently applied for the EU ETS, which reflects average GHG emissions of the 10 percent best-performing installations in the EU producing the product.

REFERENCES

Allen, M. R., Frame, D. J., Huntingford, C., Jones, C. D., Lowe, J. A., Meinshausen, M., and Meinshausen, N., "Warming Caused by Cumulative Carbon Emission towards the Trillionth Tonne," *Nature* 458 (2009): 1163–1166, https://doi.org/10.1038/nature08019.

Anger, N., "Emissions Trading beyond Europe: Linking Schemes in a post-Kyoto World," *Energy Economics* 30, no. 4 (2008): 2028–2049, https://doi.org/10.1016/j.eneco.2007.08.002.

Burtraw, D., Palmer, K., Munnings, C., Weber, P., and Woerman, M., "Linking by Degrees: Incremental Alignment of Cap-and-Trade Markets," *Discussion Paper*. Washington, April 2013, http://rff.org/files/sharepoint/WorkImages/Download/RFF-DP-13-04.pdf.

Carbon Trust, "Linking Emissions Trading Systems Prospects and Issues for Business," 2009, www.carbontrust.com/media/84900/ctc759-linking-emission-trading-systems.pdf

Duan, M., "MRV in China's ETS Pilots," 2014, www.thepmr.org/system/files/documents/9- percent20Maosheng percent20- percent20MRV percent20in percent20China percent20ETS percent20Pilots- percent20Tsinghua percent20University.pdf.

EC (European Commission), 2030 Climate and Energy Policy Framework, 2014b, www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf.

ECCC (Energy and Climate Change Committee), "The Fifth Report: Linking Emissions Trading Systems," 2015, www.publications.parliament.uk/pa/cm201415/cmselect/cmenergy/739/73902.htm.

Ecofys, "Chinese Emissions Trading Schemes—Initial Assessment on Allocation," 2014, www.ecofys.com/files/files/ecofys-2014-industry-view-chinese-ets-allocations-english.pdf

European Parliament, "Climate action and the Emissions Trading System (ETS) in China, 2016, http://europarl.europa.eu/RegData/etudes/BRIE/2016/595330/IPOL_BRI(2016)595330_EN.pdf.

Ewing, J., "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, 2016, https://asiasociety.org/sites/default/files/RoadmapNortheastern-final-online percent2B.pdf.

Flachsland, C., Marschinski, R.,Edenhofer,O., "To Link or not to Link: Benefits and Disadvantages of Linking Cap-and-trade Systems," *Climate Policy* 9, no. 4 (2009): 358-372, https://doi.org/10.3763/cpol.2009.0626.

Hawkins, B.S. and Jegou, I., "Linking Emissions Trading Schemes: Considerations and Recommendations for a Joint EU-Korean Carbon Market," 2014, www.ictsd.org/sites/default/files/downloads/2014/03/linking-emissions-trading-schemes-considerations-and-recommendations-for-a-joint-eu-korean-carbon-market.pdf.

Helm, C., "International Emissions Trading with Endogenous Allowance Choices," *Journal of Public Economics* 87, no. 12 (2003), 2737–47, https://doi.org/10.1016/S0047-2727(02)00138-X.

IETA (International Emissions Trading Association) and CDC Climate Research, "China: An Emissions Trading Case Study," March 2015, www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/china-emissions-trading-case percent20study_cdc_climat_ieta percent20march_2015.pdf.

Laing, T., Sato, M., Grubb, M., and Comberti, C., "Assessing the Effectiveness of the EU Emissions Trading System," Centre for Climate Change Economics and Policy (CCCEP) Working Paper No. 126, 2013, www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf.

Marcu. A., "Views on Mitigation Value and its Application," 2017, www.ictsd.org/sites/default/files/research/ercst-ictsd_mitigation_value_0.pdf.

Mehling, M., Metcalf, G., and Stavins, R., "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)," Faculty Research Working Paper Series, Harvard Project on Climate Agreements, September 16, 2017, https://scholar.harvard.edu/files/stavins/files/mehling-metcalf-stavins_linking_heterogeneous_climate_policies_consistent_with_the_paris_agreement.pdf.

NDRC (National Development and Reform Commission), "Notice of Implementing Pilot Carbon Emissions Trading," 2011, www.ndrc.gov.cn/zcfb/zcfbtz/201201/t20120113_456506.html.

NDRC, MOST, MOFA and MOEP, "Initial Management Measure for CDM Project in China," 2005, www.most.gov.cn/fggw/zfwj/.../P020051214632983128497.doc.
The State Council Information Office of the People's Republic of China (PRC), "The New Office of the State Council Holds a Press Conference on China's Policies and Actions in Reponse to Climate Change," November 26, 2009, www.scio.gov.cn/xwfbh/xwbfbh/wqfbh/2009/1126/index.htm.

NDRC, "12th Five-Year Plan," 2010, www.ndrc.gov.cn/fzgggz/fzgh/.../P020110919592208575015.pdf.

NDRC, "Established Seven Pilots ETS Notice," 2011, www.ndrc.gov.cn/zcfb/zcfbtz/201201/t20120113_456506.html.

NDRC, "Establishment of Offset Mechanism," 2012, http://qhs.ndrc.gov.cn/zcfg/201206/t20120621_487133.html

NDRC, "GHGs Measurements for 10 Sectors," 2013, http://qhs.ndrc.gov.cn/zcfg/201511/W020151111555540170836.pdf.

NDRC, "Establishing a National ETS Include as a deep Economic Reform Group," 2013, www.ndrc.gov.cn/xwzx/xwfb/201402/t20140214_579117.html.

NDRC, "Seven Pilots ETS Launched," 2013, www.ndrc.gov.cn/zcfb/zcfbtz/201201/t20120113_456506.html.

NDRC, "Preparation for National ETS Establishment," 2014, www.qhs.ndrc.gov.cn/zcfg/201412/t20141212_652007.html.

NDRC, "Implementation of ETSs," 2015, www.ndrc.gov.cn/gzdt/201508/t20150810_744890.html.

NDRC, "State Council Accelerates the Construction of Ecological Civilization," 2015, www.ndrc.gov.cn/gzdt/201506/t20150618_696492.html.

NDRC, "Preparation for Starting National ETS Notice," 2016, www.ndrc.gov.cn/gzdt/201712/t20171220_871134.html.

NDRC, "The 13th Five-Year Plan," 2016, http://ghs.ndrc.gov.cn/ghwb/gjwngh/201605/P020160516532440059919.pdf.

NDRC, "National ETS Kicking Out (Power Sector)," 2017, www.ndrc.gov.cn/gzdt/201712/W020171220577386656660.pdf.

The White House, "US-China Joint Announcement on Climate Change," November 2014, www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change.

Tuerk, A., Mehling, M., Flachsland, C., and Sterk, W., "Linking Emissions Trading Schemes: Concepts, Case Studies and Pathways," 2009, www.mcc-berlin.net/fileadmin/data/pdf/Publikationen/Tuerk_Sterk_Haites_Mehling_Flachsland_Kimura_Betz_Jotzo_2009_Linking_Emissions_Trading_Schemes.pdf.

UNFCCC (United Nation Framework Convention for Climate Change), "Project Activities," updated May 31, 2018, http://cdm.unfccc.int/Statistics/Public/CDMinsights/index.html.

UNFCCC, "Paris Agreement: Article 6," 2016, https://unfccc.int/sites/default/files/paris_agreement_english_.pdf.

WBCSD (World Business Council for Sustainable Development), "Establishing a Global Carbon Market: A Discussion on Linking Various Approaches to Create a Global Market," December 2012, http://belfercenter.ksg.harvard.edu/files/establishing-a-global-carbon-market-shell-version.pdf.

Zaman P., and Hedley, A., "The Regulatory Framework to Support Carbon Market Linkage—a Concept Paper," April 26, 2016, http://documents.worldbank.org/curated/en/592101491569237251/pdf/WP-PUBLIC-RegulatoryFrameworkWeb.pdf.

Zetterberg, L., "Linking the Emissions Trading Systems in EU and California," IVL Swedish Environmental Research Institute, October 2012, www.ivl.se/download/18.343dc99d14e8bb0f58b763a/1454339598890/B2061.pdf.

Zhang, Z., "Carbon Emissions Trading in China: the Evolution from Pilots to a Nationwide Scheme," Climate Policy 15, no. S1 (2015): S104–S126, https://doi.org/10.1080/14693062.2015.1096231.

9. Carbon Pricing in Japan and the Prospects for Northeast Asia Carbon Market Linking

SVEN RUDOLPH

SUMMARY

SINCE THE BEGINNING OF THE NEW MILLENNIUM, JAPAN HAS EMERGED as a major player in carbon pricing. While the Japanese Global Warming Tax (JGWT), the sink-based J-Credit Scheme, and the international Joint Crediting Mechanism (JCM) are currently operational, cap-and-trade has not yet found its way into federal-level climate policy. However, Japan's capital runs the local Tokyo Metropolitan Government Emissions Trading Scheme (TMG ETS), which is directly linked to a prefectural-level ETS in neighboring Saitama.

Against this background, using sustainability criteria as a benchmark, in this chapter I describe and evaluate the design and the results of the JGWT, the JCM, and the TMG ETS with an extension to an earlier federal-level carbon market pilot. Building upon public choice theory and empirical case study data, I then examine the political chances of establishing a full-fledged national carbon market in Japan in the near future. Finally, I explore the chances and barriers of sustainable Northeast Asian carbon market integration.

I mainly argue that Japanese carbon pricing cannot yet be considered sustainable. Also, despite a variety of experiences with carbon trading, the current political climate in Japan does not fuel expectations for a national carbon market. This renders solving technical design issues of Northeast Asian carbon market integration much less challenging than overcoming domestic political barriers in Japan. The most promising candidate for Northeast Asian carbon market linkages at the moment is still the TMG ETS.

CARBON PRICING IN JAPAN AND THE PROSPECTS FOR NORTHEAST ASIAN CARBON MAKET LINKING

From Economic Theory to Climate Policy Practice

Carbon pricing is still the preferable policy option for sustainable climate policy. The Paris Agreement is certainly a diplomatic success, but it must be substantiated by more ambitious targets and convincing policies to achieve its major goal of "[h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels."[1] So far, domestic climate action in the signatory states falls significantly short of this goal.[2] Article 6 of the agreement explicitly allows the use of internationally transferred mitigation outcomes (ITMOs)[3] or, in economic terms, the trading of greenhouse gas (GHG) emissions rights.

Emissions trading or better cap-and-trade has received almost unanimous support from neoclassical environmental economists on the grounds of environmental effectiveness and economic efficiency.[4] It has been shown that a sustainable design, not only taking into account effectiveness and efficiency but also considering social justice, is possible.[5] Surprisingly, the resulting design recommendations do not exhibit major contradictions among environmental, economic, and social goals but rather point in the same direction: coverage should be comprehensive in terms of polluters and pollutants, caps should be scarce and based on the 2°C target, the initial allocations should be based on auctioning, revenues should be used mainly for compensating detrimental distributional effects on low-income households, and only truly sustainable offsets should be allowed. Sustainable carbon markets would then even directly answer the Paris Agreement call to "reflect equity."[6]

In addition, linking domestic schemes can significantly improve the sustainability of carbon markets.[7] This becomes particularly important as domestic schemes have become more widespread, extending not only to several continents and countries but also to all governance levels from local to supranational.[8] Especially in countries with strong political resistance to federal-level carbon markets, subnational policies can be considered an important supplement to international or national action. Nobel laureate Elinor Ostrom has already emphasized the importance of polycentric climate policy,[9] and the New Environmental Federalism now objects to earlier warnings of a "race to the bottom" and underscores the value of subnational regimes as policy laboratories, where policies can be tailored to residents' preferences and to particular infrastructural needs.[10]

Despite a variety of experiences with carbon trading, the current political climate in Japan does not fuel expectations for a national carbon market.

However, the implementation of sustainable cap-and-trade faces a series of political barriers. Public choice, the economic theory of politics, argues that rational, self-interested political actors would not support ambitious market-based approaches to environmental protection: voters fear higher energy costs and producers higher production costs, environmental bureaucrats fear the devaluation of their idiosyncratic knowledge and skills as well as costs of transition from traditional to new policy approaches, politicians cannot signal a high activity level as well as in the case of traditional command-and-control regulations and fear voters' and industry's opposition, and only politically weak environmental groups would be respond favorably.[11] It concludes that there is a "market tendency for the political process to resist market mechanisms for rationing scarce environmental resources."[12] In sum, while linked carbon markets are promising, the political barriers appear almost insurmountable.

Carbon Pricing in Japan

Japan has been applying carbon pricing since the beginning of the new millennium with ambiguous results. Economic theory predicts carbon markets to be economically efficient and environmentally effective and, if designed well, even socially just. In Japan, the Ministry of the Environment (MOE) implemented the experimental Japan Voluntary Emission Trading Scheme (JVETS) with a particular design in 2005.[13] While participation was voluntary, incentives to participate arose from subsidies being granted to facilities to partly cover their compliance costs. JVETS covered carbon dioxide (CO_2) emissions from combustion only. Targets were fixed bottom up by companies in absolute volume terms at a level at least one percentage point lower than status quo emissions of the preceding year. Allowances were handed out free of charge according to individual company targets. Also, Kyoto Protocol credits could be used for compliance. Borrowing of allowances was not permitted, while banking was unlimited. Trading was carried out via a trading platform administered by the ministry. Monitoring followed Kyoto Protocol guidelines, with penalties for noncompliance, including the reimbursement of subsidies as well as the publication of company names in a "name-and-shame" scheme. However, the results of JVETS were mixed: all participants met their individual targets in every compliance period and participants' total emissions were reduced by 29 percent below base-year levels, thus even exceeding commitments. Also, a functioning monitoring and trading system was established. Nevertheless, participants' total reductions summed to only 0.03 percent of total 1990 GHG emissions in Japan, mainly because major emitters such as utilities and energy-intensive industries did not participate. The average price for allowances was JPY 1,200, and trading has not been very active throughout the program.

Intense and productive follow-up discussions on a national carbon market in working groups and political committees continued until 2010. But eventually, despite explicitly announcing the introduction of a federal carbon market in the campaign leading up to the 2009 general election and an intensified internal discussion on the design specifics, the Democratic Party of Japan (DPJ) deliberately ended the respective discussion in December 2010, an outcome that would have resulted anyway from the loss of government to the Liberal Party in 2012.[14] In sum, early experiences with national carbon markets in Japan were ambiguous. The only operational program, JVETS, cannot be considered a sustainable solution—for example, due to voluntary participation, the lack of a top-down cap, and free initial allocation. Still, it cannot be emphasized enough that the process helped establish a market and monitoring infrastructure, upon which future programs could still build, particularly if combined with the vast knowledge produced in working groups and committees now waiting to be dug out.

Instead of a national carbon market, Japan implemented the Japanese Global Warming Tax (JGWT) in 2012 as part of its post-Kyoto climate strategy to reduce GHG emissions by 26 percent by 2030 compared to 2013 levels.[15] It is imposed on fossil fuel consumption by using CO_2 emission factors for each fuel. The tax rate per quantity unit was set so that the tax burden equals JPY 289 per ton of CO_2 emissions. Hence, tax rates vary for each type of fuel. They are added on the preexisting Petroleum and Coal Tax. The tax rates were to be raised gradually over three and a half years to their final level in April 2016; since 2016 the tax rate has been frozen and there is no plan for further increases. Exemptions and refunds are provided for certain fuels and measures. Revenues are to be used for energy-related CO_2 emissions reductions measures such as energy savings, the promotion of renewable energy, and the clean and efficient use of fossil fuels. A ministry study estimated the emissions reductions of the JGWT to be between 0.5 percent and 2.2 percent in 2020 compared to 1990 levels or about 6 million to 24 million tons of CO_2. An additional study estimated CO_2 emissions reductions for 2030 compared to 2013 to be around 7.3 percent, which are almost entirely achieved by revenue spending, not the price incentive. Negative impacts on the gross domestic product (GDP) have been negligible, as have detrimental impacts on low-income households. Still, mainly due to low tax rates, the JGWT cannot be considered sustainable.

More promising is a local initiative, the TMG ETS.[16] Tokyo launched its uniquely designed scheme in 2010 as part of its strategy to reduce GHG emissions by 20 percent by 2020 compared to 2000 levels. Due to commercial activities' big share in emissions, the mandatory program focuses on CO_2 emissions from the end use of energy in large office buildings, thus covering around 1,200 facilities and a share of 21 percent of Tokyo's total CO_2 emissions. The caps were set at a level of 8 percent/6 percent and 17 percent/15 percent below base-year emissions for office buildings/factories in the first (2010–2014) and second (2015–2019) phases. Participants can chose the base period by using average emissions of three consecutive years between

2002 and 2007. The total absolute volume cap then results from adding up individual facility targets. Instead of distributing emission allowances, the Tokyo program defines reduction obligations and only issues excess reduction credits (ERC) if these obligations are exceeded. Hence, the TMG ETS follows the cap-and-trade approach but limits trading to excess allowances and offsets. Four types of offsets are accepted from small and midsize companies, from renewable energy projects, from installations outside of Tokyo but inside Japan, and from the neighboring linked Saitama Prefecture. Banking of credits is allowed, while borrowing is prohibited. Since 2011, bilateral trading of credits has been allowed, while no stock exchange is used. But the Tokyo government supports facilities—for example, with supply-demand-matching fairs. Noncompliance is penalized by a fine of up to JPY 500,000, a 1.3 times ex post shortage coverage, and the publication of facilities' names. At first glance, the TMG ETS seems to be well designed, especially considering its innovative character. While the design still cannot be called truly sustainable—for example, due to a lack of ambitions concerning the targets, limited coverage, and free initial allocation, actual results are compelling. By 2016, covered facilities had reduced emissions by 26 percent, significantly overachieving the targets. Trading activities have steadily increased while allowance prices have dropped from estimated USD 100 in 2011 to below USD 30 in 2016.

Since 2013, Japan has also been running the Joint Crediting Mechanism (JCM).[17]Already in the first commitment period of the Kyoto Protocol, Japan made extensive use of the Flexible Kyoto Mechanisms. Japan's 2008 Kyoto Protocol Target Achievement Plan aimed at a 6 percent GHG reduction, of which 1.6 percent was supposed to be covered by Flexible Kyoto Mechanism credits. In the end, 97,493,000 tons of CO_2 were retired.[18] Still, Japan was not satisfied with the UN procedures and as a consequence developed its own crediting program, the JCM, with a goal of generating credits worth 50–100 million tons of CO_2e by 2030. The major aim of the JCM is to contribute to Japan's GHG reduction obligation under the Paris Agreement by diffusing low carbon technology to developing countries and thus achieving low cost reductions. A Joint Committee of government officials from both Japan and the project host country develops guidelines bilaterally. Currently Japan collaborates with 17 countries, mainly from Southeast Asia but also from Africa and Latin America. Projects are proposed by the project partners or governments and then approved by the Joint Committee. Project partners develop the Project Design Document, which is then validated by a third-party entity before being registered by the Joint Committee. Project partners monitor performance, and third-party entities verify emissions reductions prior to the Joint Committee's issuance of credits. Emissions reductions are calculated based on a comparison of conventional and low carbon technology use over the entire project cycle; thus, the JCM basically follows a baseline-and-credit-approach. By the end of 2017, based on 40 methodologies in the areas of renewable energy, energy efficiency, transport, and waste management, 20 projects had been registered worth 10,000 tons of CO_2e with more than 100 waiting to enter the process. Still, the baseline-and-credit design alone creates reasonable doubts about the JCM's sustainability, and the current practice substantiates the suspicion that the JCM acts as a foreign investment tool rather than as a climate policy instrument.

Japanese Climate Politics

The power balance in Japanese climate politics does not fuel hopes for a national carbon market in the near future. Public choice, the economic theory of politics, expects sustainable carbon markets to be politically unfeasible. In Japan, climate politics support this notion to a large extent.[19] While surveys show general support of climate policy, issues such as jobs, security, and the aging population dominate the Japanese public's political interests. Climate policy instrument choice is of minor interest, as it is seen as a genuine task of the government, but fears of higher energy prices persist, trading of pollution rights is still seen as immoral, and incentives are deemed dispensable as morality-based collective action is considered sufficient. However, the political influence of the Japanese public is rather low. Votes in general elections are usually not cast based on environmental considerations, and generating pressure by anti-government political protest is still deemed illegitimate.

Japanese environmental non-governmental organizations (NGOs), such as World Wide Fund for Nature (WWF) or Kiko-network, naturally strongly support climate action and the Paris Agreement. At the policy instrument level, NGOs in Japan support carbon pricing. While the JGWT is thought to be a step forward after years of only voluntary industry action, it is considered insufficient, and a stringent national cap-and-trade scheme is still preferred due to the absolute limit to total emissions induced by the cap. However, despite the homogeneity of interests, Japanese NGOs' political influence is very low. Mainly due to the still believed illegitimacy of anti-government movements, many groups lack membership, financial support, and highly skilled personnel for intensively engaging in climate action campaigning and lobbying. Not least, networks with like-minded actors in political parties, ministries, companies, or research institutions are underdeveloped, due to the general distrust of protest movements.

Japanese NGOs' opponents in industry, mainly gathered in the major industry organization Keidanren, however, command a well-established network with the now ruling, conservative, and industry-friendly Liberal-Democratic Party (LDP) and the mighty Ministry of the Economy, Industry, and Trade (METI). This "Iron Triangle" has been partly responsible for Japan's economic rise after World War II and is thus considered almost untouchable. Climate policy interests in Keidanren are dominated by energy-intensive industries and power generators, which command an abundance of financial and human resources. Support by labor unions, which fear job loss due to stringent climate policies, adds to industry's political power. In terms of interest, apart from less influential proactive sectors such as financial services, insurance, or renewable energy, most Japanese industries are still strongly opposed to stringent climate policy and carbon pricing, because they mainly fear competitive disadvantages. Industry favors voluntary action and only agreed to the JGWT in 2011 to prevent an even more feared federal cap-and-trade scheme. And industry's opposition continues to be the primary barrier to ambitious carbon pricing in Japan.

Ministries traditionally dominate policy making in Japan. They are responsible not only for implementing programs but also for preparing and drafting laws, which are then only officially legitimized by the Japanese Diet. Japan's public administration is supplied with significant financial and personnel resources, making them Japan's original think tanks. Ministry officials' interests are strongly influenced by their academic training and the specific institutions they work for. Ministry officials are exclusively and purposefully trained to be civil servants at Tokyo University; after being hired, they show utmost loyalty to the ministries they are working for. This often leads to intense competition and interministerial tension, in the case of climate policy mainly between MOE and METI. While MOE has been supportive of ambitious climate action and carbon pricing, METI's interests are closely aligned with those of Keidanren, and the ministry has only supported win-win or no-regret solutions for industry such as the Keidanren Voluntary Action Plan, Japanese industries' main approach to climate protection. Support of the JGWT was only granted to prevent a national cap-and-trade scheme. The power balance between the two ministries is clearly tilted in favor of METI, mainly because it has long been part of the Iron Triangle. METI is also the biggest ministry in Japan in terms of personnel and is officially responsible for energy policy. MOE, on the other hand, shares some responsibility for climate policy with METI and was only elevated from agency to ministry status in 2001, making it one of the youngest ministries in Japan. Not least, collaboration with NGOs and other environmentally minded forces is at best underdeveloped.

As climate policy does not represent a decisive voting issue for Japanese citizens, politicians aiming at being (re)elected also do not put an emphasis on this issue. On the party level, the major opposition party, the moderate left-wing Constitutional Democratic Party of Japan (CDP), leans more toward environmental topics than the now ruling conservative and industry-friendly LDP. But even the CDP's predecessor, the DPJ, was not capable of implementing sustainable carbon pricing during its last term of office from 2009 to 2012. The LDP has been dominating Japanese politics since World War II. Part of the reason is its collaboration with industry and METI. A similar "green" counterforce coalition—for example, of the DPJ, MOE, and environmental organizations, does not exist. In any case, parliamentarians' political power is strictly limited by the dominance of the Japanese bureaucracy.

In sum, the most influential political forces in Japan still openly oppose a national carbon market or are at least skeptical.

The Prospects of Northeast Asian Carbon Market Cooperation

While technical design issues can be solved, political barriers in Japan limit the prospects for Northeast Asian carbon market integration. The merits of and the technical requirements for linking have been studied extensively in the literature.[20] It has also been shown that linking domestic carbon markets does not only improve economic and environmental performance of carbon markets, but it additionally increases social justice and hence makes climate policy more sustainable.[21]

In addition to theoretical insights, both the EU and North American subnational jurisdictions have gathered experiences with linking, most of which have been positive. While the EU negotiated linking agreements (e.g., with Australia), which failed, and Switzerland, which succeeded, after the EU ETS had already been running for some time, North American jurisdictions from the beginning aimed at linking. While the Regional Greenhouse Gas Initiative (RGGI) was constructed as a linkage between basically independent U.S. northeast states' program guided by a Model Rule, California and its partners in Canada negotiated a Model Rule under the umbrella of the Western Climate Initiative (WCI). When California implemented the first domestic scheme with the WCI in 2013, it adhered to the guidelines and was later followed by Québec and more recently Ontario. And even the now pending U.S. Clean Power Plan (CPP) offers a similar carbon market Model Rule to states wanting to comply with federal standards by using domestic and possibly linked cap-and-trade programs. Not least, there is a broad landscape of supporting international institutions such as the International Carbon Action Partnership (ICAP) and the World Bank's Partnership for Market Readiness (PMR), which would be eager to help in advancing Northeast Asian carbon market linkages.

However, the biggest challenges are political rather than technical. First, historically, political relations between China, Japan, and Korea have been tense. Adding to this, political and economic systems and current performances differ a great deal, which make international collaboration on climate and energy policy challenging. Second, climate policy ambition differs. While all targets have to be considered "highly insufficient"[22] with respect to the 2°C target, only Japan has an absolute volume cap (–26 percent/–18 percent by 2030 base 2013/1990), while China promised to peak its CO_2 emissions by 2030 at the latest and lower the carbon intensity of its GDP by 60 to 65 percent below 2005 levels by the same time, and Korea intends to reduce GHG emissions by 37 percent below business-as-usual (BAU) emissions (+100 percent base 1990). Price reactions to linking ambitious to less ambitious schemes would be significant with the respective economic and political consequences. Third, carbon market design differs greatly. Korea is the only country with a full-fledged operational national cap-and-trade program, while China has several subnational schemes in place with the national ETS still remaining in its pilot phase, and Japan only operates a baseline-and-credit offsetting scheme on the national level and the comparatively well-designed TMG ETS on the local level. And worse, there is no intention to establish a national cap-and-trade scheme in Japan for the time being, although the MOE is funding scoping studies on its implementation. Particularly linking cap-and-trade to baseline-and-credits schemes generates a set of nontrivial issues.

Overcoming political barriers to Northeast Asian carbon market linking appears to be far more challenging than solving technical design issues.

In sum, overcoming political barriers to Northeast Asian carbon market linking appears to be far more challenging than solving technical design issues. This is especially true for Japan in the current political climate. Still, with increasing pressure on domestic climate action from the Paris Agreement and the nationally determined contributions (NDCs), expected compliance cost increases, and the maturing of domestic carbon markets in China and Korea (and some possible outreach of the EU or subnational North American jurisdictions), chances for a linked Northeast Asian carbon market could increase. For preparation and even facilitation, the following steps could be taken:

(1) promote, establish, and reform (toward more sustainable solutions) domestic carbon cap-and-trade schemes with the explicit intention to link,
(2) develop a Northeast Asian carbon market model rulebook as a guideline for countries willing to join a linked market, and
(3) start with a coalition of the willing, a club of carbon markets,[23] with Korea and Tokyo being the most immediate candidates.

Hope remains that "[i]f it is feasible to establish a market to implement a policy, no policy-maker can afford to do without one,"[24] and that Northeast Asia becomes a leading force in the development of an international, sustainable, market-based policy approach to achieving the Paris Agreement's 2°C target.

ENDNOTES

[1] United Nations (UN), *Paris Agreement* (New York: United Nations, 2015), Art. 2.

[2] United Nations Framework Convention on Climate Change, *Aggregate Effect of the Intended Nationally Determined Contributions* (synthesis report by the secretariat) (Bonn: United Nations Framework Convention on Climate Change Secretariat, 2016).

[3] UN, *Paris Agreement*, Art. 6.

[4] Alfred Endres, *Environmental Economics: Theory and Policy* (Cambridge: Cambridge University Press, 2011).

[5] Sven Rudolph et al., "Towards Sustainable Carbon Markets," in *Carbon Pricing, Growth and the Environment—Critical Issues in Environmental Taxation*, Vol. XI, eds. L. Kreiser et al. (Cheltenham, UK/Northampton, US: Edward Elgar, 2012), 167–183.

[6] UN, *Paris Agreement*, Art. 3.

[7] Sven Rudolph et al., "Developing the North American Carbon Market—Prospects for Sustainable Linking," in The Green Market Transition: Carbon Taxes, Energy Subsidies and Smart Instrument Mixes—Critical Issues in Environmental Taxation, Vol. XIX, eds. Stefan Weishaar et al. (Cheltenham, UK/Northampton, US: Edward Elgar, 2017), 209–230.

[8] International Carbon Action Partnership (ICAP), "Emissions Trading Worldwide: Status Report 2018" (Berlin: ICAP, 2018).

[9] E. Ostrom, "A Polycentric Approach for Coping with Climate Change" (Washington, DC: World Bank, 2009) (Background Paper to the 2010 World Development Report).

[10] W. E. Oates, "A Reconsideration of Environmental Federalism," in *Environmental Policy and Fiscal Federalism*, ed. W. E. Oates (Cheltenham, UK/Northampton, USA: Edward Elgar, 2004), 1–32.

[11] G. Kirchgässner and F. Schneider, "On the Political Economy of Environmental Policy," *Public Choice* 115, no. 3 (2003): 369–396. In addition to barriers emphasized by actor-based public choice arguments, the multitude and complexity of indirect effects of carbon markets, (environmental) justice implications, and possible financial flows across jurisdiction borders might create additional political barriers to carbon markets.

[12] R. W. Hahn, "Jobs and Environmental Quality—Some Implications for Instrument Choice," *Policy Sciences* 20, no. 4 (1987): 289–306, at 289.

[13] Junko Mochizuki, "Assessing the Designs and Effectiveness of Japan's Emissions Trading Scheme," *Climate Policy* 11 (2011): 1337–1349. See also Sven Rudolph and Seung-Joon Park, "Lost in Translation? The Political Economy of Market-Based Climate Policy in Japan," in *Critical Issues in Environmental Taxation*, Vol. VIII—International and Comparative Perspectives, eds. Claudia Dias Soares et al. (Oxford: Oxford University Press, 2010), 163–184.

[14] Sven Rudolph and Friedrich Schneider, "Political Barriers of Implementing Carbon Markets in Japan—A Public Choice Analysis and the Empirical Evidence before and after the Fukushima Nuclear Disaster," Environmental Economics and Policy Studies 15, no. 2 (2013): 211–235.

[15] Takeshi Kawakatsu, Soo-cheol Lee, and Sven Rudolph, "The Japanese Carbon Tax and the Challenges to Low-carbon Policy Cooperation in East Asia," in *Tax and the Environment*, eds. Roberta Mann and Tracey Roberts (Lanham, MD: Rowman & Littlefield, forthcoming).

[16] Sven Rudolph and Toru Morotomi, "Acting Local! An Evaluation of the First Compliance Period of Tokyo's Carbon Market," *Carbon and Climate Law Review* 10, no. 1 (2016): 75–78.

[17] www.carbon-markets.go.jp/eng/jcm/index.html; https://www.jcm.go.jp/about.

[18] Ministry of Economy, Trade and Industry of Japan, "Kyoto Mechanisms Credit Acquisition Program in FY2013, April 2014, www.meti.go.jp/english/press/2014/0401_02.html.

[19] Rudolph and Schneider, "Political Barriers of Implementing Carbon Markets in Japan."

[20] M. Ranson, and R. N. Stavins, "Linkage of Greenhouse Gas Emissions Trading Systems," *Climate Policy* 16, no. 3 (2015): 284–300, https://doi.org/10.1080/14693062.2014.997658.

[21] Sven Rudolph, Achim Lerch, and Takeshi Kawakatsu, "Developing the North American Carbon Market—Prospects for Sustainable Linking," in *The Green Market Transition: Carbon Taxes, Energy Subsidies and Smart instrument Mixes—Critical Issues in Environmental Taxation*, Vol. XIX, eds. Stefan Weishaar et al. (Cheltenham, UK/Northampton, US: Edward Elgar, 2017), 209–230.

[22] Climate Action Tracker (CAT), http://climateactiontracker.org/.

[23] Ned Keohane, Annie Petsonk, and Alex Hanafi, "Toward a Club of Carbon Markets," *Climatic Change* 144, no. 1 (2017): 81–95.

[24] John H. Dales, *Pollution, Property & Prices—An Essay in Policy-making and Economics* (Cheltenham, UK/Northampton, MA: Edward Elgar, 1968), 100.

10. The Potential of Carbon Market Linkage between Japan and China

TOSHI H. ARIMURA

INTRODUCTION

INTERNATIONAL COOPERATION IS ESSENTIAL TO ADDRESS THE CLIMATE CHANGE ISSUE, given its scale and urgency. Northeast Asian countries such as China, Korea, and Japan have great potential to contribute to climate change mitigation because of their technical capacities and scales. First, Japan has long been a global leader in energy efficient technologies. Thus, Japan can help developing economies reduce their greenhouse gas (GHG) emissions by sharing and deploying its established technologies. Korea, similarly, can provide investment and expertise into technological solutions in developing countries. China, as the largest global emitter of GHGs, has great potential to reduce emissions. Cooperation among these countries can potentially lead to the efficient control of GHG emissions from various perspectives.

One strategy to realize this potential is to create an international carbon market by linking the emissions trading systems (ETSs) among Northeast Asian economies. Although Japan lacks a domestic emissions trading system at the national level, there are linked subnational emissions trading schemes in Tokyo and Saitama. Korea implemented a national ETS in 2015. In 2013, China started seven pilot schemes in Beijing and other cities/provinces. In 2017, China announced the introduction of a national-level scheme (see chapter eight of this volume).

Currently, these markets in Northeast Asia operate independently. As economic theory suggests that trading goods among nations increases the nations' welfare, the linkage of carbon markets in the three countries is also expected to improve the nations' welfare and save costs in GHG emissions abatement (see chapter five of this volume). In this chapter, I discuss barriers and benefits to potential carbon market linkage between Japan and China. Focusing on the Japanese context and challenges, I argue that limited carbon market links with China could have advantages for stakeholders in each country, and benefit global climate efforts.

BENEFIT OF CARBON MARKET LINKAGE FOR THE JAPANESE ECONOMY

High Cost of Abatement in Japan

Northeast Asian carbon market linkage is attractive for Japan. The first reason is Japan's nationally determined contribution (NDC) to the Paris Agreement on climate sets an emissions reduction target of 26 percent below 2013 levels by 2030.[2] Moreover, the government announced an aspirational goal of 80 percent reduction by 2050. Achieving these goals will require both innovation and investment.

Japan is considered to have higher marginal abatement costs among developed economies as shown in many model analyses. For example, Akimoto et al. (2015) show that the marginal abatement cost (MAC) for the 2030 target is approximately USD 380 per ton of CO_2eq according to a model called DEN+21.[3] The model also estimates the MAC for the European Union (EU) and finds that it ranges from USD 60 per ton of CO_2 at the lower cost case to USD 69 at the higher cost case. Japan's MAC levels therefore outstrip those of other developed economics, to say nothing of developing economies where costs are consistently lower.

China is no exception, and its lower MACs could offer opportunities to Japan through market connectivity. For example, Takeda et al. (2015) examine the economic impact of carbon market linkage among major emitters such as the EU, the United States, China, and Japan. These authors find that China becomes a net exporter of permits while Japan becomes a net importer because of its higher MAC. Hübler et al. (2014) also analyze the linkage of the EU ETS and the future Chinese ETS and find that China becomes an importer of permits, which would hold even truer for a link with Japan given its higher MAC than those in the EU.

Carbon market linkage has an important economic implication. Economists use "welfare" to measure economic well-being. Takeda et al. (2015) report that the welfare of the Japanese economy will increase by 0.04 percent with the linkage of its national-level ETS to global carbon markets, in which the EU, the United States, Canada, and China are the major players. Given their fundamental economic and emissions characteristics—embodied through MAC levels—China and Japan can therefore create a symbiotic relationship through linkage.

Emission Reduction Targets and Energy Policy in Japan

Japanese energy policy also reinforces the case for carbon market linkage. Current trends suggest that Japan will face difficulties in achieving these emissions reductions in both 2030 and 2050. First, the 2030 target is based on the Japanese energy mix policy, which assumes that 20 to 22 percent of all electricity will be generated from nuclear power in 2030.[4] Japan experienced the Great East Earthquake in 2011, which was followed by the nuclear accident in Fukushima. In response to this accident, the government tightened the safety standards for nuclear power plants. Consequently, power companies have had to invest in safety technologies to comply with new standards. In some cases, the power companies decided to decommission power plants such as Mihama or Tsuruga[5] because of technical difficulties or additional costs to clear the new safety standards. Even if the power companies were to invest to meet the safety standard, they would often face opposition from the local communities. In fact, several lawsuits are pending against power companies to shut down nuclear power plants even if they cleared the new safety standards. Indeed, in several cases local courts have ordered nuclear power plants to stop operation, and power companies must obey. For example, in May 2014, "Fukui District Court issued a judgment that suspended reactors No. 3 and No. 4 of KEPCO's Ōi Nuclear Power Station" (Kamikawa, 2017, 137). Consequently, in 2016, nuclear power accounted for only 1.6 percent of all electric power generation in Japan.[6] Thus, the achievement of a 20 percent reduction by 2030 is made more difficult by the reversal to nuclear growth trends in the wake of the Fukushima crisis.[7]

Japan must therefore rely more heavily on other energy sources for power generation. Despite the generous feed-in tariff policy[8] after the earthquake, renewable energy such as solar and wind, excluding hydrogen, accounted for only 7.8 percent in 2016. The majority of power generation was fossil fuel based in 2016; 40.4 percent came from natural gas, and 33.3 percent came from coal. There are also numerous plans for new coal power plant construction, particularly since the deregulation of the electricity sector.[9]

One way to overcome this difficulty is to make use of overseas abatement opportunities. Japan made substantial use of the Clean Development Mechanism (CDM) under the Kyoto Protocol, including through investment from power and steel companies (Arimura et al., 2017). However, the Japanese government has left the Kyoto Protocol since 2013 because the biggest emitters of GHG such as China and the United States were not part of the protocol. Consequently, Japan is not allowed to use CDMs, which only the Kyoto Protocol permits.

Partly out of frustration with the CDM, Japan created its own offset system, the Joint Crediting Mechanism (JCM) (Arimrua et al., 2012). Under the JCM, Japan collaborates with host countries on the creation and operationalization of clean energy projects, from which both obtain emissions reduction credits (Sugino et al., 2017). The JCM is financed by the Japanese government and has historically had a limited budget and a rather small amount of associated emissions credits. This may change, however, with Japan exploring increases to the JCM and expanding carbon pricing in part as ways to solve the emissions reduction challenges outlined in the previous section.[10] Still, further efforts will likely be needed beyond offsetting for Japan to reach its climate targets in a cost-effective manner.

However, Japan's current lack of a national market leaves the Tokyo and Saitama linked markets as the current candidates for further linkage abroad—including with China.

TOKYO ETS AND CARBON MARKET LINKAGE: OPPORTUNITIES AND CHALLENGES

As mentioned in the introduction of this chapter, Japan can benefit from obtaining emissions credits from China at prices below its domestic MAC levels. However, Japan's current lack of a national market leaves the Tokyo and Saitama linked markets as the current candidates for further linkage abroad—including with China.

Tokyo ETS for Carbon Market Linkage?

The Tokyo ETS was first announced in 2007. As of 2018, the Tokyo Metropolitan Government is scheduled to continue this scheme until 2019. It consists of two phases. Phase I ran from 2010 to 2014, and Phase II is planned to continue from 2015 to 2019. During Phase I, mandatory CO_2 reductions of 8 percent and 6 percent from a base-year level were imposed on office buildings and manufacturing facilities, respectively. A facility that could not attain this goal faced fines unless it acquired enough credits for compliance.

The Tokyo ETS aims to mitigate the CO_2 emissions from large-scale facilities, which are defined as facilities that consume 1,500 kilolitres or more of oil equivalents energy per year. In 2013, a total of 1,392 facilities had to comply with the Tokyo ETS. Emissions allowances are given freely to each facility. The amounts are an 8 percent (6 percent) reduction from the baseline emissions for commercial (manufacturing) facilities. In determining the baseline, facility managers can choose three consecutive years from 2002 to 2007 (Nishida and Hua, 2011).

A unique feature of the Tokyo ETS is that it was the first cap-and-trade program to regulate commercial buildings (Nishida & Hua, 2011). Commercial facilities account for approximately 80 percent of regulated facilities. This point is quite different from the existing ETSs implemented at that time in other countries. For example, the EU ETS regulates emissions from manufacturing facilities and power plants. In another case, the Regional Greenhouse Gas Initiative is a scheme targeted for power plants in the U.S. northeast.

There are four types of emission credits in the Tokyo ETS. The first is *excess emissions reduction credit*. Facilities can earn this type of credit when they achieve their annual obligation, that is, 8 percent or 6 percent emissions reduction for commercial and manufacturing facilities, respectively.

In addition to excess emissions reduction credits, to mitigate the burden for facilities, the Tokyo government provides three types of domestic offset credits. The first offset credit is *small- and medium-sized installation credits within the Tokyo area*. Entities can earn this credit by investing in small- and medium-sized facilities that are not regulated by the Tokyo ETS. The second type of offset credit is *outside Tokyo credit*. An organization can earn this type of credit by reducing GHG emissions in facilities outside Tokyo. The third type of offset credit is *renewable energy credit*.

Finally, facilities in Tokyo can use credits from Saitama, a prefecture next to Tokyo. Saitama implemented an ETS in 2011. This ETS also has two phases. Phase I was from 2011 to 2014. Phase II started in 2015 and will continue until 2019. Saitama followed Tokyo in developing the design of its ETS. The difference is that the emissions target is voluntary, not mandatory. Another difference is that the majority of facilities are within the manufacturing sector. Saitama has also successfully reduced emissions from the baseline by 22 percent.

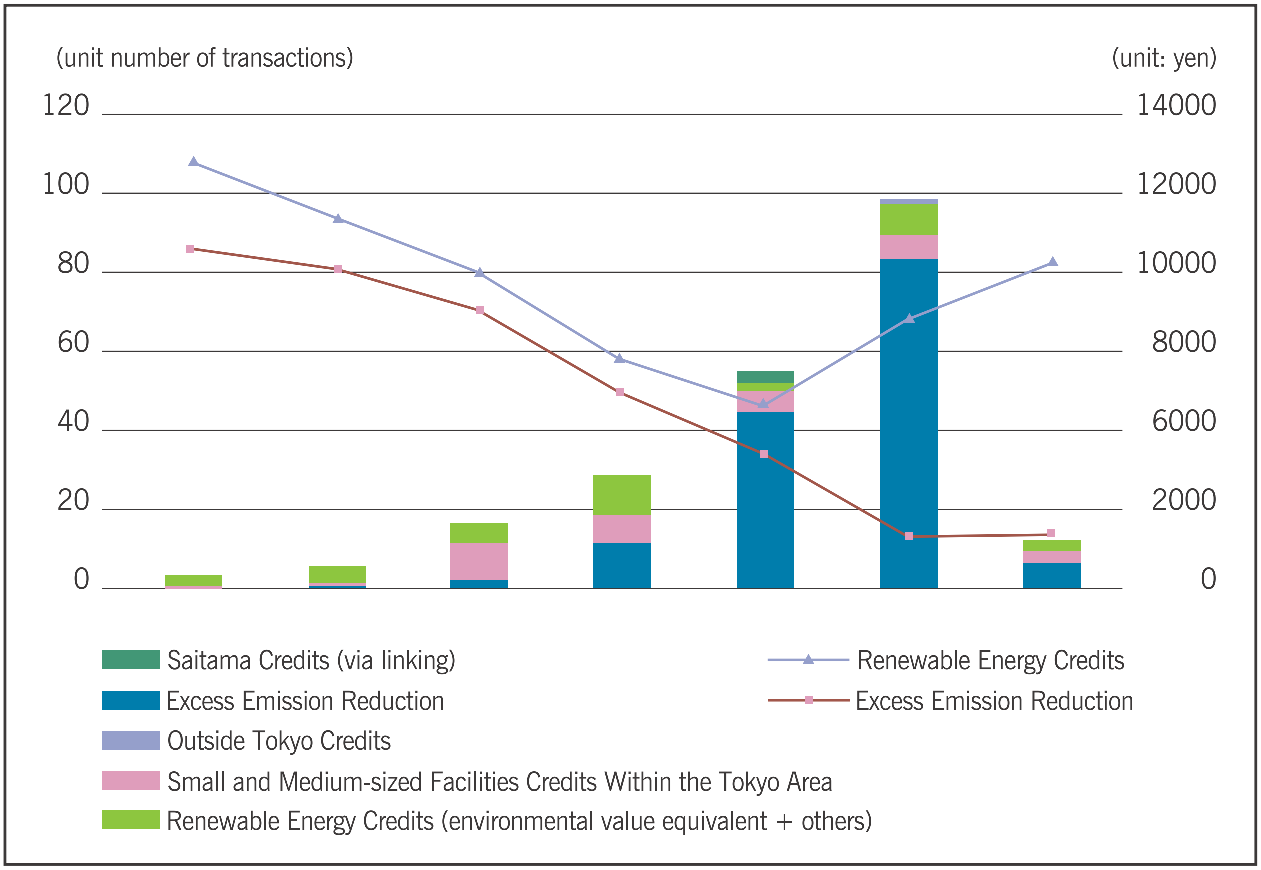
Figure 10.1 illustrates the number of transaction in the Tokyo ETS by credit type for each year. One can observe that the number of transactions has increased over the years. In particular, in 2016, the number of transactions was close to 100. This increase was due to the compliance of the Phase I period, which ended in 2015. There was, however, a grace period until 2016. Therefore, facility managers did not have to submit the required credits for compliance until the middle of 2016. Consequently, we observed somewhat "more" transactions in 2016.

One can argue, however, that the number of transactions has been quite limited, given the number of facilities under the Tokyo ETS. More than 1,300 facilities have the obligation of emissions reduction and thus are eligible for permit trading. The market is "thin" for the Tokyo ETS. If this carbon market can be linked to markets in China, one can expect an increase in the number of transactions, which will help establish a stable price signal. This factor is an important reason why carbon market linkage in Northeast Asia is desirable from the Japanese perspective.

Issues to be Addressed for the Tokyo ETS Before Carbon Market Linkage

It is possible that the linkage of carbon markets in Northeast Asia can stimulate the Tokyo ETS. However, some issues must be solved before the Tokyo ETS can become part of the linked carbon market.

FIGURE 10.1. PERMIT PRICE AND THE NUMBER OF CREDIT TRANSCATIONS IN THE TOKYO ETS



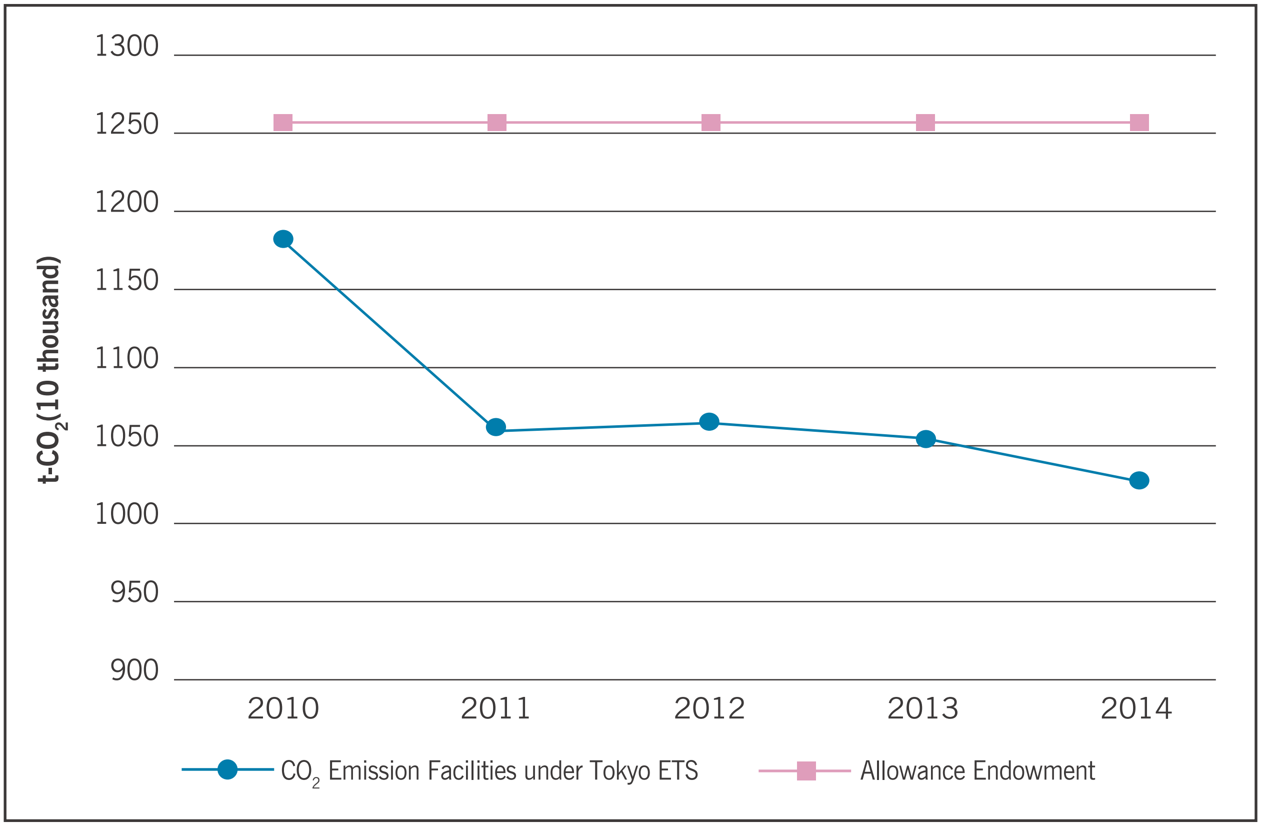
Source: Created by author from publicly available information: Bureau of Environment of the Tokyo Metropolitan Government, "The Results of Emissions Trading and the Intentions of Businesses Regarding Emissions Trading," December 2017, http://www.kankyo.metro.tokyo.jp/climate/large_scale/trade/index.files/siryou2-1_jisseki-ikou201712.pdf.

Banked Permits

There are some challenges in linking the Tokyo ETS to foreign ETSs. Figure 10.2 shows the transition of CO_2 emissions from facilities under the Tokyo ETS during Phase I and the 8 percent reduction from the baseline emissions, which approximately captures the total allowance permits. One can observe that CO_2 emissions are reduced more than required in Phase I. Sizable permits are banked for usage during Phase II. The baseline emission for the regulated emissions is 13.6 million tons. By 2014, the emissions decreased to 12.5 million, which is approximately an 8 percent reduction from the baseline. The surplus is banked for use during Phase II. Therefore, the demand to purchase permits from overseas carbon markets during Phase II of the Tokyo ETS does not seem to be strong largely because of the successful reduction in Phase I and of reduction targets that lack strong ambition.[11]

The Tokyo Metropolitan Government is ready to design Phase III of the Tokyo ETS. If it chooses a more stringent target, then there may be a demand for permits from the Chinese market, making targeted links more desirable.

FIGURE 10.2. CO_2 EMISSIONS AND ALLOWANCES ENDOWMENT IN THE TOKYO ETS



Source: Created by author from publicly available information: Bureau of Environment of the Tokyo Metropolitan Government, "Tokyo's Cap-and-Trade System: All Target Companies Achieved CO_2 Reduction Obligations of Phase I," November 4, 2016, http://www.kankyo.metro.tokyo.jp/climate/large_scale/data/index.files/candtpuresusiryouhonnbun.pdf.

Limitation of Usage of Foreign Permits

At the present time, the Tokyo ETS does not allow the use of international credits. The market was intentionally designed as "semi-closed" and shielded from international markets to reduce price volatility (Nishida and Hua, 2011). The Tokyo government intentionally chose this design to deflect criticism about capital flow to foreign countries. Japanese industry had to spend a large amount of money to purchase CDM credits to achieve the emissions target under the Voluntary Action Program (VAP) (Arimura et al. 2016). VAP consists of voluntary emission target and commitments by each industry association. Japanese industry associations criticized this spending, claiming that it was a waste of money. In response to this criticism, the Tokyo government prepared the variety of offset mechanisms noted earlier. These concerns would also pertain to potential future linkages in Northeast Asia. In response, the Tokyo Metropolitan Government must set some limits on the number of permits accepted from foreign counties (see chapter six of this volume).[12] Such policy designs would reduce but not remove the efficiency gains of linkage while making it more politically and commercially palatable.

Money Game Criticism and Limitation of Participants

When designing its carbon market, the Tokyo Metropolitan Government also had to address "money game criticism" (Roppongi, 2016). ETS sceptics claim that carbon markets are susceptible to speculation by investors and suffer from volatile prices. They claim that the volatility hurts the effectiveness of the ETS as environmental policy because it does not promote investing in low carbon technology with weak price signals. A similar criticism was an important element of ETS discussions in Korea and Europe as well (Kim, 2014).

To address this concern, only bilateral trades among emitters are allowed in the Tokyo ETS. Separate financial players cannot enter. Moreover, trading is possible only after the emissions reduction is confirmed. This feature resembles the design of Phase I in the Korean ETS (Kim, 2014).[13] Consequently, the trading of permits is not as active as that in other markets, as shown in Figure 10.1.

PROSPECTS FOR A NATIONAL ETS IN JAPAN AND ISSUES TO BE SOLVED

The most severe barrier for carbon market linkage in Northeast Asia is the lack of a national-level ETS in Japan. In 2010, the Japanese Ministry of the Environment (MOE) invited stakeholders and academics to discuss the possible design. Facing opposition from energy-intensive industries, the cabinet led by the Democratic Party of Japan decided not to introduce the ETS, at least not immediately. The heated discussion on climate policy in 2010 ended with the introduction of a feed-in tariff and a low level carbon tax of JPY 289 per ton of CO_2.

The discussion about the ETS revived when the Paris Agreement was adopted in 2015. In 2017, the MOE held public committee meetings on carbon pricing by inviting experts on the issue. After nine public meetings, the MOE presented two possible options for carbon pricing. One is a carbon tax. The second is to introduce the ETS for large emitters and the carbon tax for the rest of the economy such as households, transportation, and small- and medium-sized emitters.

If an ETS is introduced nationwide in Japan, the energy-intensive trade industry (EITE) is expected to express concerns on the competitiveness issue and the associated carbon leakage. Several options can address these issues, including free allowance allocation to the EITE (Sugino et al., 2013), border adjustment (Takeda et al., 2012), or output-based allocation of permits (Takeda et al., 2014). In addition to these options, the national government can use credits from overseas markets. If this becomes an option to address the competitiveness issue, then the link to the Chinese ETS may be a possibility.

Even if an ETS is introduced at the national level in Japan, several issues must be solved before linking carbon markets in Northeast Asia. The first issue is related to equity in NDCs as Takeda and Arimura (2017) suggest. Japan is likely to gain economic benefits when participating in an international carbon market if the emissions target is fixed. However, in Japan, there is strong opposition to purchasing emissions allowances that are considered "hot air,"[14] that is, not verifiable and robust. Moreover, even if it is not hot air, emissions trading across countries is likely to be regarded as unfair unless equity in the NDCs across different countries is secured to some extent. Specifically, a situation where regions with significantly lower NDC targets than other regions sell emissions allowances is regarded as unfair. The pattern of trading of emissions allowances depends strongly on the level of NDCs. Therefore, if some convertible equity is not secured in the determination of NDCs, the trading of emissions allowances is not considered fair, and as a result, international cooperation is suppressed.

Another important issue is the quality of measurement, reporting, and verification (MRV), which form essential parts of the governance of an ETS. Therefore, any national or local government exerts effort to have high-quality ETSs. MRV is essential to exchange emissions internationally. Japanese industry has strong confidence in quality control in general. This confidence applies to the quality of MRV of carbon emissions. Unfortunately, the MRV quality seems to differ across countries. Japanese firms are skeptical of foreign MRV, especially those in developing countries. To promote carbon market linkage, it is necessary to establish a mechanism that ensures a certain level of MRV quality.

However, if these barriers can be overcome, there is promise in Japan expanding its international efforts to reduce emissions. Lower-cost domestic options are likely to continue to be difficult to attain, and mutually beneficial cooperation with China through limited carbon market linkage offers a valuable potential tool for climate change progress.

ENDNOTES

1 For example, see Systems Analysis Group, Research Institute of Innovative Technology for the Earth (RITE), "International Comparisons of Energy Efficiency (Sectors of Electricity Generation, Iron and Steel, Cement)," January 11, 2008, www.rite.or.jp/system/en/global-warming-ouyou/download-data/E-Comparison_EnergyEfficiency.pdf.

2 United Nations Framework Convention on Climate Change (UNFCCC), "Submission of Japan's Intended Nationally Determined Contribution (INDC)," July 17, 2015, www4.unfccc.int/submissions/INDC/Published percent20Documents/Japan/1/20150717_Japan percent27s percent20INDC.pdf

3 DEN+21 is a technology choice model built by the RITE. See details in Akimoto (2015).

4 Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry of Japan 資源エネルギー庁, "2030-Nen enerug□mikkusu hittatsu no tame no taisaku ～ sh□ene, sai ene-t□ ～" 2030年エネルギーミックス必達のための対策 ～省エネ､再エネ等～ [Measures for Achieving 2030's Energy Mix—Energy Conservation, Renewable Energy, etc.], November 28, 2017, www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/022/pdf/022_006.pdf.

5 "Mihama Tsuruga no hai-ro kettei kei 3-ki, saisan awazu" 美浜･敦賀の廃炉決定　計３基､採算合わず [Mihama and Tsuraga's Decision to Decommission 3 Nuclear Facilities Is Unprofitable], Nihon Keizai Shinbun日本経済新聞, March 17, 2015, www.nikkei.com/article/DGXLASDZ17H5W_X10C15A3MM0000/.

6 Ibid.

7 For further analysis on how Japan's nuclear rollback is creating problems for its climate change goals, see Jackson Ewing and Minyoung Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, https://asiasociety.org/sites/default/files/2017-12/NextGen percent20Report percent20FINAL percent20WEB.pdf.

8 For the value of the tariff, see Arimura (2015).

9 For example, see Yuka Obayashi and Ami Miyazaki, "New Coal Power Plants May Block Japan's Carbon Emissions Goal: Minister," Reuters, June 29, 2017, www.reuters.com/article/us-japan-environment-analysis/new-coal-power-plants-may-block-japans-carbon-emissions-goal-minister-idUSKBN19K15Z; or Nikkei Asian Review Staff, "Japan to Allow New Coal Power Plant But Demand Cuts Elsewhere," *Nikkei Asian Review*, January 12, 2018, https://asia.nikkei.com/Politics-Economy/Policy-Politics/Japan-to-allow-new-coal-power-plant-but-demand-cuts-elsewhere.

10 "'Sign of Change'?: Japan's Environment Ministry to Draw Up Carbon Pricing Proposal," *Carbon Pulse*, March 19, 2018, https://carbon-pulse.com/49198/.

11 For further evidence of the lack of ambition in the Tokyo ETS, see Ewing and Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation."

12 Also see Jackson Ewing, "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, https://asiasociety.org/sites/default/files/RoadmapNortheastern-final-online percent2B.pdf.

13 Participation of third-party business, that is, financial business, is banned until 2021 in the Korean ETS (Kim, 2014).

14 "Hot air" in ETS refers to surplus allowances that can be sold by polluters without the extra cost of abatement. It often refers to allowances that Russia obtained under the Kyoto Protocol.

REFERENCES

Akimoto, K., B. S. Tehrani, F. Sano, J. Oda, M. Kainuma, T. Masui, and K. Oshiro, "MILES (Modelling and Informing Low Emissions Strategies) Project—Japan Policy Paper: A Joint Analysis of Japan's INDC," 2015, www.iddri.org/Publications/Collections/Analyses/MILES_Japan percent20Policy percent20Paper.pdf.

Arimura, T. H., "Japanese Environmental Policy," in *Routledge Handbook of Environmental Economics in Asia*, ed. S. Managi (New York and London: Routledge, Taylor & Francis Group, 2015), 516–531.

Arimura, T. H. and T. Abe, "An Empirical Study of Tokyo Emission Trading Scheme: An Ex-post Analysis of Emissions from Office (Commercial Buildings) and University Buildings." Presented at IAEE European Conference, Vienna, Austria, September 2017.

Arimura, T. H., S. Kaneko, S. Managi, T. Shinkuma, M. Yamamoto, and Y. Yoshida, "Political Economy of Voluntary Approaches: A Lesson from Environmental Policies in Japan." Tokyo Center for Economic Research (TCER) Paper, E-107, 2016. http://tcer.or.jp/wp/pdf/e107.pdf.

Arimura, T. H., T. Miyamoto, H. Katayama, and H. Iguchi, "Japanese Firms' Practices for Climate Change: Emission Trading Schemes and Other Initiatives." *Sophia Economic Review* 57, no. 1–2 (2012): 131–154.

Hübler, M., S. Voigt, and A. Löschel, "Designing an Emissions Trading Scheme for China—An Up-to-date Climate Policy Assessment," *Energy Policy* 75 (2014): 57–72.

Kamikawa, R., "Nuclear Policy after 3.11," in *Aftermath: Fukushima and the 3.11 Earthquake*, eds., Y. Tsujinaka and H. Inatsugu (Balwyn North: Trans Pacific Press, 2017), 95–149.

Kanako, M. and K. Matsumoto, "Renewable Energy-Related Policies and Institutions in Japan: Before and after the Fukushima Nuclear Accident and the Feed-In Tariff Introduction," in *Legal Issues of Renewable Energy in the Asia Region: Recent Development in a Post-Fukushima and Post-Kyoto Protocol Era*, eds. Anton Ming-Zhi Gao and Chien Te Fan (The Netherlands: Kluwer Law International, 2014), 3-28.

Kim, E. S., "Imagining Future Korean Carbon Markets: Coproduction of Carbon Markets, Product Markets, and the Government," *Journal of Environmental Policy & Planning*, 16, no. 4 (2014), 459–477.

Roppongi, H., "The Role of Sub-National Actors in Climate Change Policy," Center for Asian Studies, Asie.Visions, No. 86, www.ifri.org/sites/default/files/atoms/files/av_86_en_db_ok_protege_0.pdf.

Sugino, M., T. H. Arimura, and R. D. Morgenstern, "The Effects of Alternative Carbon Mitigation Policies on Japanese Industries," *Energy Policy*, 62 (2013): 1254–1267.

Sugino, M., M. Morita, K. Iwata, and T. H. Arimura, "Multiplier Impacts and Emission Reduction Effects of Joint Crediting Mechanism: Analysis with a Japanese and International Disaggregated Input-Output Table," *Environmental Economic and Policy Studies* 22, no. 3 (2017): 1–23.

Takeda, S. and T. H. Arimura, "International Cooperation on Climate Policy from the Japanese Perspective," in *International Cooperation in East Asia to Address Climate Change*, eds. Robert N. Stavins and Robert C. Stowe (Cambridge, MA: Harvard Project on Climate Agreements, 2017), 23–26.

Takeda, S, T. H. Arimura, and M. Sugino, "Labor Market Distortions and Welfare-Decreasing International Emissions Trading," WINPEC Working Paper Series No. E1422, March 2015, www.waseda.jp/fpse/winpec/assets/uploads/2015/06/No.E1422Takeda_Arimura_Sugino.pdf.

Takeda, S., T. H. Arimura, H. Tamechika, H. C. Fischer, and A. K. Fox, “Output-based Allocation of Emissions Permits for Mitigating the Leakage and Competitiveness Issues for the Japanese Economy,” *Environmental Economics and Policy Studies* 16 (2014): 89–110.

Takeda, S., T. Horie, and T. H. Arimura, “A Computable General Equilibrium Analysis of Border Adjustments under the Cap-and-Trade System: A Case Study of the Japanese Economy,” *Climate Change Economics* 3, no. 1 (2012): 1–30.

11. The Business of Linking Carbon Markets in Northeast Asia

STEFANO DE CLARA

SUMMARY

THIS CHAPTER EXPLORES THE ROLE OF THE BUSINESS COMMUNITY in discussions on carbon market linkage in Northeast Asia. China, the Republic of Korea (hereafter Korea), and Japan have witnessed significant developments in their domestic market-based policies during this decade and are expected to be among the most active jurisdictions in this space going forward. If the three countries are to explore options to link their respective carbon markets in the future, the business community will be central to the discussion.

This chapter also takes stock of recent developments with the aims of understanding what role the private sector plays in the discussion on linkages and of reflecting on the possible way forward.

To this end, the paper starts by offering a brief overview of the latest developments in Northeast Asian carbon markets, with a particular focus on China, Korea, and Japan. The paper also analyzes the engagement of the private sector in carbon markets and explores levels of business support for carbon market linkage.

After reviewing the potential for carbon market linkage under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), the paper looks specifically at the prospects for carbon market linkage in Northeast Asia and at what role the private sector can play in this regard.

LATEST DEVELOPMENTS IN NORTHEAST ASIA CARBON MARKETS

China, Korea, and Japan have witnessed significant developments in their domestic market-based policies during the past decade, and are expected to be among the most active jurisdictions in this space going forward. Korea launched the first-ever nationwide emissions trading system (ETS) in Northeast Asia in January 2015. The system is now entering its second phase of operations. China has experimented with several ETS pilot systems since 2013 and announced the launch of a nationwide system in December 2017. Japan, despite not having a national ETS in place, has been experimenting with different forms of market-based climate policies, ranging from city-level ETSs to innovative and ambitious international crediting mechanisms.

These developments are addressed more in detail elsewhere in this volume and pose questions about the region's future carbon market trajectory. A maturation of these recently launched policy frameworks will be needed in each respective country, and in the coming years more systems are expected to arise in other countries in the region—likely including Singapore, Thailand, and Vietnam. But the most interesting question is whether Northeast Asian systems will continue to operate in isolation or consider possible forms of collaboration and linkage. This chapter explores what role the business community could play in this process.

BUSINESS ENGAGEMENT IN CARBON MARKETS AND THE BUSINESS CASE FOR LINKING CARBON MARKETS

The business community can be an active advocate for the implementation of emissions trading systems and for the use of linked carbon markets as a way to reduce emissions. The International Emissions Trading Association (IETA) brings together more than 130 businesses around the world in support of the adoption of carbon markets worldwide and actively advocates for the linking of different systems. Ahead of COP21, the landmark conference where world's leaders adopted the Paris Agreement, IETA, together with 19 other business associations estimated to collectively represent more than 100,000 business entities,[1] issued a letter on the importance of including provisions for the establishment of international carbon markets in the Paris Agreement.[2] Individual statements from some of these organizations followed the letter.[3] The strong push from the private sector was one of the drivers behind the inclusion of market provisions in the Paris Agreement, which is analyzed later in this chapter.

The most interesting question is whether Northeast Asian systems will continue to operate in isolation or consider possible forms of collaboration and linkage.

The reason behind this support was that having market provisions in the Paris Agreement was seen as a key enabler of carbon market linkage. The benefits that can arise from linked carbon market systems were highlighted in some of the aforementioned statements from the business community:

- The creation of a level playing field and prevention of competitive distortions,
- The avoidance of carbon leakage,
- The ability to reduce emissions at lower costs,
- The development of comparable policy frameworks leading to more consistent operating environments, and
- Having allowances that are fungible in multiple systems.

IETA members have specifically and through written testimony[4] also highlighted linkage benefits such as the following:

- The stabilization of carbon prices,
- Increasing liquidity,
- New cost efficiency opportunities to be identified beyond borders, and
- A step toward the implementation of an international framework for climate action.

CARBON MARKET LINKAGE, THE PARIS AGREEMENT, AND THE ROLE OF THE PRIVATE SECTOR

Carbon market linkage can take different forms and can be implemented through different political processes. Some of these processes are explored elsewhere in this volume; here, we focus on the international framework that will regulate cross-boundary climate action in the post-2020 period: the Paris Agreement.

The linking of two emissions trading systems can of course happen in a bilateral manner between two countries. Those two countries are free to set the rules they prefer for that linkage to happen and operate under, but if the emissions reductions achieved under the linking arrangement are to be recognized as part of the fulfillment of the two countries' nationally determined contributions under the Paris Agreement, the linked system has to abide by the rules and requirements set out by the Agreement itself.

Given that countries in Northeast Asia are at different stages in the implementation of their domestic policies, a fully fledged carbon market linkage is not assured and if implemented will require years of collaborative effort.

The Paris Agreement, adopted in December 2015 and entered into force in November 2016, contains provisions that can facilitate the linkage of domestic carbon markets. These provisions, which are in line with those the business community advocated for in the run-up to COP21, can be found in Article 6 of the Agreement.[5]

Article 6.2, in particular, allows Parties to "engage on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes (ITMOs) towards nationally determined contributions."[6] Over the past two years, UNFCCC negotiations have focused on defining the rules for the operationalization of the Paris Agreement, commonly referred to as the "Paris Rulebook," in a process that is expected to be concluded at COP24, taking place in December 2018.

The exact definition of an ITMO and the exact operationalization of Article 6.2 are thus still being defined. Nevertheless, when reading Article 6.2, it is quite easy to imagine one of its most obvious practical applications as the linkage of multiple emissions trading systems. Much of the potential for carbon market linkage under the Paris Agreement will therefore depend on how Article 6, as well as the Paris Agreement as a whole, will be operationalized in the Paris Rulebook.

Another important aspect not yet defined is the role of the private sector in Article 6 operations. Article 6.3 hints at this issue by stating, "The use of internationally transferred mitigation outcomes to achieve nationally determined contributions under this Agreement shall be voluntary and authorized by participating Parties," meaning that Parties, obviously, are ultimately responsible for the application of Article 6.2.[7] What remains to be decided is how, for example in the case of a linked system, this authorization will be transferred to the compliance entities and the other players in the linked carbon market.

The definition of these aspects and their application in the real world potentially carry deep implications on the functioning and efficiency of a linked market. The business community is therefore monitoring this issue closely, as rules are being defined and are expected to be delivered by the end of 2018.

The key issue, from the perspective of business, is to make sure that the rules are drafted in such a way to allow open and optimized private sector participation in these mechanisms. This will also impact the effectiveness of future linked systems. This mirrors businesses' desire for continuity and access to low-cost opportunities in domestic contexts and has been laid out in a comprehensive vision for the implementation of Article 6.[8]

PROSPECTS FOR CARBON MARKET LINKAGE IN NORTHEAST ASIA AND THE ROLE OF THE PRIVATE SECTOR

Northeast Asia offers exciting opportunities for future carbon market linkage as regional domestic markets continue to mature. Linking is in most cases a lengthy process. Given that countries in Northeast Asia are at different stages in the implementation of their domestic policies, a fully fledged carbon market linkage is not assured and if implemented will require years of collaborative effort.

China, Korea, and Japan will very likely prioritize the implementation, stabilization, and optimization of their domestic systems before starting the linking process. Nevertheless, while domestic developments are progressing, a number of international initiatives with relevant implications for linking are also moving ahead:

- China, Korea, and Japan are involved in an annual Trilateral Summit, which addresses market linkage and collaboration among other topics.[9]
- Japan and Korea are signatories to the Ministerial Declaration on Carbon Markets, led by New Zealand.[10]
- Japan is part of, and has chaired, the G7 Carbon Market Platform, which is also open to other countries willing to participate.[11]
- Japan and China are participating, in different capacities, in the Word Bank's Partnership for Market Readiness.[12]
- Korea and Japan participate in the Asia Pacific Carbon Market Roundtable, facilitated by New Zealand.[13]
- China, Korea, and Japan are all involved at government, private sector, and epistemic levels in the track II project *Toward a Northeast Asia Carbon Market* led by the Asia Society Policy Institute.

The risk of policy failure if the private sector is not aware of the intentions of policy makers and consulted on policy construction can be extremely high.

These active discussions are a positive sign that key stakeholders in Northeast Asia are considering carbon market linkage in detail and seeking pathways toward its execution. The business community, which both impacts and is impacted by carbon market policies throughout the region, needs to be involved across policy-making processes.

The risk of policy failure if the private sector is not aware of the intentions of policy makers and consulted on policy construction can be extremely high.[14] The Korean ETS (KETS) offers an example, with one of the main reasons for the lack of liquidity in the market being the lack of trust, among covered entities, in the market regulator. The problem concerns both that compliance entities believed the initial allocation levels were inadequate, leading to several lawsuits, and the lack of transparency on future allocation levels—two problems that could have been solved through an adequate involvement of the private sector in the policy-making process and with better dialogue and information sharing. This has been compounded in Korea by the vacillation of the carbon market policy platform from the Ministry of Environment (MOE) to the Ministry of Strategy and Finance (MOSF) and most recently back to the MOE.

The private sector can help governments enrich the quality of the information available to them, which in turn translates to better and more informed policy making. The most widespread practice for stakeholder involvements to date are calls for oral or written input, which has become standard practice in many jurisdictions. However, governments have come to realize that other practices can allow for a deeper involvement of the private sector. These include structured dialogues, informal expert discussions, and active workshops designed to foster constructive, problem-solving, dialogue. These best practices and recommendations are valid not only for the UNFCCC process but also apply to domestic policy making and throughout the aforementioned regional discussion fora.

The three key business arguments for linking—competitiveness, market functioning, and cost effectiveness—are highly relevant in the Northeast Asia context.

Looking more closely at the linkage discussion in Northeast Asia, an optimal involvement of the business community in the policy-making process can deliver tangible benefits and can help facilitate the process. While it is still unclear what form a future carbon market linkage in Northeast Asia can take, some key considerations are universally applicable. Engaging with the business community can do the following:

- Help build consensus around the carbon market linkage. Given the support for linkage outlined previously, securing an optimal involvement and engagement of the private sector in the process can help ensure that the latter becomes a strong and proactive ally and advocate.
- Help facilitate the process. The aforementioned support in the private sector can, in turn, enhance the acceptability and strength of a policy. This is especially true in the case of a carbon market linkage, as the private sector is the key player in this kind of policy.
- Bring important experiences and lessons learned. Some businesses involved in a linkage discussion in Northeast Asia are likely to have gained relevant experiences in other jurisdictions, for instance, as participants in the Western Climate Initiative (WCI) linked system or in the EU ETS-Norway link. These businesses will be able to share their insights on what worked and what did not in other linked markets. These experiences and lessons can be used to inform the policy-making process and will benefit both policy makers and the private sector, as well as helping deliver better and more durable policies.

The aforementioned experiences and lessons learned, combined with feedback from the business community on the key design options of the carbon market linkage, are essential to make sure that the linkage is designed in an optimal way, and in a manner that maximizes the support of the private sector.

To maximize benefits, business engagement should be kept at the forefront throughout the process, and not only on sporadic occasions, starting with the early stages of the discussions on international collaborations and linking.

China, Korea, and Japan are interlinked by long-standing business and trading relations, and many private sector actors operate across all jurisdictions. They are major trading partners and many companies have operations in neighboring jurisdictions.[15] These are ideal conditions for carbon market linkage to emerge, both because existing trade relations can facilitate the creation of the linkage and because the benefits of linking are maximized, especially concerning international competitiveness distortions and the harmonization of different systems.

The three key business arguments for linking—competitiveness, market functioning, and cost effectiveness—are highly relevant in the Northeast Asia context.

From a competitiveness perspective, having a linked system can help reduce the fear of competitive disadvantage compared to businesses operating in other countries in the region. This will be particularly beneficial for businesses in Korea, Japan, and China facing competitors in one of the other two countries. Linkage will result in a more level playing field across the countries involved and will reduce distortions, which in turn will mitigate concerns about ambitious climate policies.

From a market functioning perspective, a well-designed linkage can improve the functioning and effectiveness of domestic systems by improving liquidity, which is a key shared concern throughout the region, and by widening the market. Moreover, linking often also implies a harmonization of the systems involved, with a consequent linearization of the rules, which will be beneficial for multinational businesses operating in China, Korea, and Japan.

From a cost-effectiveness perspective, linkage ensures access to a larger pool of emissions reduction opportunities, which can lower overall abatement costs compared to domestic action alone. This is of particular importance for countries such as Korea and Japan, which have reported in their nationally determined contributions that they plan to achieve part of the mitigation effort beyond national borders.

CONCLUSIONS AND THE WAY FORWARD

Widely held views in the business community on the value and potential of linking carbon markets are particularly salient to the Northeast Asian context.

The business community can play a key role in making such carbon market linkage a reality. If correctly involved, the business community can act as a key advocate for carbon market linkage and can help facilitate the process. Moreover, by bringing its unique experiences and insights to the table, the private sector can help design well-functioning and long-lasting policies.

Some conditions are essential for this to happen. It is vital to ensure adequate government-to-business interaction at multiple steps of the policy-making process. The private sector should be adequately informed about future policy developments and policy makers' intentions. The business community should be consulted and actively engaged both to provide feedback on policy proposals and to be able to leverage the relevant experiences and lessons learned business has to offer.

ENDNOTES

[1] International Emissions Trading Association (IETA), "Business Keeps the Pressure on for Carbon Pricing in the Paris Agreement," 2015, http://bit.ly/2GOcDbi.

[2] IETA, "Joint Letter on the Importance of Carbon Markets in the Paris 2015 Climate Agreement," 2015, http://bit.ly/2t3BwgW.

[3] IETA, "What Business Wants: Carbon Pricing in Paris," 2015, http://bit.ly/2ou3pKw.

[4] IETA, "The Select Committee on Energy and Climate Change's Inquiry on Linking Emissions Trading Systems: Written Evidence Submitted by the International Emissions Trading Association," 2014, http://bit.ly/2orz67l.

[5] United Nations, "Paris Agreement," 2015, http://bit.ly/245GrVi.

[6] Ibid.

[7] Ibid.

[8] See IETA, "A Vision for the Market Provisions of the Paris Agreement," 2016, http://bit.ly/2oBZLxp. 2016; IETA, "Article 6 of the Paris Agreement Implementation Guidance. An IETA "Straw Proposal," 2014, http://bit.ly/2BUOMrd.

[9] Jackson Ewing and Minyoung Shin, "Northeast Asia and the Next Generation of Carbon Market Cooperation," Asia Society Policy Institute, December 2017, http://bit.ly/2FCAnzy.

[10] New Zealand Ministry of Environment, "Ministerial Declaration on Carbon Markets," 2015, http://bit.ly/2EVEcD4.

[11] Germany Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, "Carbon Market Platform," 2015, http://bit.ly/2EVFsBZ.

[12] The World Bank, "The Partnership for Market Readiness: Participants," 2016, http://bit.ly/2GPG78J.

[13] New Zealand Ministry of Foreign Affairs and Trade, "What We Do Globally," 2018, http://bit.ly/2BTSCAM.

[14] IETA, "Enhancing Engagement of Business at UNFCCC," 2017, http://bit.ly/2oz7Vqk.

[15] Jackson Ewing, "Roadmap to a Northeast Asian Carbon Market," Asia Society Policy Institute, September 2016, https://asiasociety.org/sites/default/files/RoadmapNortheastern-final-online percent2B.pdf

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

Other Asia Society Policy and Business Reports

Reconciling Expectations with Reality in a Transitioning Myanmar

Business Sector Action to Drive Carbon Market Cooperation in Northeast Asia

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

Northeast Asia and the Next Generation of Carbon Market Cooperation

Preserving the Long Peace in Asia

The Trump Administration's India Opportunity

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

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

Roadmap to a Northeast Asian Carbon Market

India's Future in Asia: The APEC Opportunity

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

High Tech: The Next Wave of Chinese Investment in America

Sustaining Myanmar's Transition: Ten Critical Challenges

Chinese Direct Investment in California

Delivering Environmentally Sustainable Economic Growth: The Case of China

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

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

Pakistan 2020: A Vision for Building a Better Future

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

North Korea Inside Out: The Case for Economic Engagement

Asia Society®

Preparing Asians and Americans for a Shared Future

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

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

COVER IMAGES: Glowing Blue Earth China, Japan, and Far East, imaginima/Getty Images. Smoke emitting from chimney stack, low angle view, Wolfgang Weinhaeupl/Getty Images