# INTERNATIONAL COOPERATION IN EAST ASIA TO ADDRESS CLIMATE CHANGE

Harvard Project on Climate Agreements

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# International Cooperation in East Asia to Address Climate Change

Edited by:

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## Non-Market (and Modified-Market) Approaches to International Cooperation

# INTRODUCTION

Three countries in East Asia — the People's Republic of China, Japan, and the Republic of Korea — together accounted for approximately 28% of global greenhouse-gas (GHG) emissions in 2014.[1] In addition, GHG emissions are increasing rapidly in the region. Therefore, in order to address global climate change effectively, it is essential that the countries of East Asia (as well, of course, as other large global emitters) implement effective climate-change policies. It will also be valuable for governments in the region to work together as they design and implement their respective policies. Such international cooperation has the potential for accelerating and amplifying national ambition to reduce GHG emissions.

This volume includes fifteen briefs examining various approaches to cooperation in East Asia to address climate change.[2] Authors of the briefs include sixteen participants in a research workshop that the Harvard Project on Climate Agreements conducted on September 27, 2017, in Shanghai on this topic.[3] These participants engaged a total of eight additional global experts as co-authors. The final set of authors include social scientists (economists, political scientists) and legal scholars who have studied climate-change policy, plus several policy practitioners. They are based in Japan, New Zealand, the People's Republic of China, the Republic of Korea, the Republic of Singapore, the United Kingdom, and the United States.

The volume begins with four briefs describing the status of domestic climate-change policy in China (X. Zhang), Japan (Hongo; Takeda and Arimura), and Korea (Kim) — in some cases with examinations of how international collaboration might evolve on the basis of these domestic policies.

The remainder of the volume is organized around the provisions of the Paris Agreement's Article 6, which is intended to facilitate international cooperation to address climate change. The second major section of the volume deals with linkage between and among policy systems — corresponding to (and likely enabled by) Article 6.2. The last major section addresses non-market and modified-market approaches to cooperation, which are mandated by Article 6.8 of the Paris Agreement.

Linkage has the potential for lowering the aggregate cost of emissions reduction and thereby prompting national governments to adopt increasingly ambitious climate-change policies over time. The first three briefs in the second major section review prospects for linkage among existing or proposed emissions-trading systems in East Asia (H. Oh and I.Y. Oh) — with some focus on Northeast Asia (Ewing; Ritchie and Park). The last three examine how the Paris Agreement's Article 6 might facilitate linkage in the region. Mehling, Metcalf, and

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1 World Resources Institute, CAIT; http://cait.wri.org. 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.

2 The editors are grateful to Marika Tatsutani for editing the briefs and to Bryan Galcik for layout and design of the document.

3 An account of the workshop is at: www.belfercenter.org/publication/cooperation-east-asia-address-climate-change.

Stavins summarize a major research project of the Harvard Project on Climate Agreements that explores how, when, and whether nations might pursue linkage among the *heterogeneous* national policies that will be characteristic of Nationally Determined Contributions under the Paris Agreement. The following two briefs closely examine synergies between Article 6 and potential implementation of linkage in the region (Mo and Lu; Teng).[4]

In the last major section of the volume, five briefs discuss approaches to national policy and international cooperation that either do not involve market-based mechanisms or that build upon market-based policies in a novel manner. The first brief examines "regional cooperation platforms," building upon current trade and investment mechanisms in the region (Huang and J. Zhang). Chung then explores how Article 6 might incentivize linkage in the longer term, but in the shorter term might provide opportunities for other forms of cooperation — possibly through "regional climate clubs." The third brief (Kerr, Lubowski, and Heilmayr) offers a "climate teams" model that attempts to address deficiencies in linkage and offset systems through carefully structured transactions of mitigation units. Next, Karplus discusses how considerations of co-benefits — specifically, reduction of local air pollutants — might advance climate-change policy and international cooperation. Finally, Andrews-Speed examines a range of cooperative initiatives for enhancing power connectivity — primarily in Southeast Asia — that could enable development and dispatch of low-carbon generation.

The Harvard Project on Climate Agreements is grateful to the Harvard Global Institute,[5] which provided funding for both the workshop and the preparation of this volume. The Institute supports research initiatives that deepen Harvard University's international engagement and promote University-wide scholarship to address pressing global challenges, such as climate change, migration, and urbanization. The Harvard Project also thanks Harvard Center Shanghai[6] for hosting the workshop — providing a venue that contributed greatly to the success of the event.

Robert N. Stavins
Director

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## Reference

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

4 See also Stavins and Stowe (2017).

5 https://globalinstitute.harvard.edu

6 Harvard Center Shanghai collaborates closely with the Harvard Global Institute. See: https://shanghaicenter.harvard.edu.

# COMPILATION OF KEY POINTS

## National Policies and Perspectives

**Xiliang Zhang:** ***Policy Initiatives to Address Climate Change in China: An Overview***

- China is formulating policy initiatives consistent with its international pledges and national targets for addressing climate change.
- Institutions will need to be established to create effective political incentives for local leaders to pay attention to addressing climate change.
- The role of market-based policy instruments in mitigating climate change should be extended.

**Takashi Hongo:** ***Climate Change Policy in Japan and the Role of "International Contributions"***

- Japan is considering changes to its emission-reduction strategy in light of the difficulty of achieving its 2030 target under the Paris Agreement with a lower contribution from nuclear-power generation.
- Views differ on the role of carbon pricing in Japan: Some analysts have concluded that Japan already has one of the world's highest carbon prices and therefore cannot raise its carbon price without harming the economy, while others point to the need for industrial restructuring to increase value added per ton of carbon emissions in the Japanese economy.
- Emissions trading is viewed with caution in Japan, because of concerns about price volatility and the risk of speculation. However, leverage to achieve additional emissions reductions via an increase in the carbon tax seems to be limited.
- Japan can make an important contribution to international mitigation efforts, by providing public and private support for emissions-reduction activities in other countries and by helping to develop effective quantification and accounting mechanisms in support of broader, cross-national carbon markets and carbon "clubs."

**Shiro Takeda and Toshi H. Arimura:** ***International Cooperation on Climate Policy from the Japanese Perspective***

- Japan has failed to adopt a national-level emissions trading scheme (ETS), but some local jurisdictions have done so.
- International cooperation on climate policy not only brings economic benefits to Japan, but it also energizes the stagnant climate-policy environment in Japan.
- To promote international cooperation on climate policy, however, Japan will need to resolve issues such as equity in Nationally Determined Contributions (NDCs) and the quality of measurement, reporting, and verification (MRV) under the Paris Agreement.

**Joojin Kim:** ***Key Issues for the Korean Emissions Trading Scheme and their Implications for International Linkage Discussions in Northeast Asia***

- One of the most important features of the Korean Emissions Trading Scheme (K-ETS) is that third-party market makers are not allowed to trade in the market.
- Another important issue is that Korean power-market rules have neutralized the fuel-switching incentive provided by a carbon price because they do not allow carbon costs to be reflected in market-bid prices.
- Lastly, uncertainty about Korea's future nuclear- or coal-power mix have been significantly affecting market operation by, for example, delaying second-phase credit allocations.
- The K-ETS is a market-based mechanism in a government-dominated economy. This is one of the reasons why discussions about international linkage have not been picking up as quickly as expected.

## Cooperation through Linkage of Policy Systems

### —Prospects for Linkage of Market Mechanisms in East Asia

**Hyungna Oh and Il-Young Oh:** ***Possible Linkage among Emissions Trading Systems in East Asia***

- Due to the scale of greenhouse gas emissions and the enormity of the mitigation challenge to avert dangerous levels of global climate change, individual carbon markets in East Asia and the possibility of linking these markets in the future have attracted international attention.
- Incremental steps to linking carbon markets in East Asia should now be considered. Such steps could include, first, indirect linkages that use internationally or mutually recognized credits (possibly Internationally Transferred Mitigation Outcomes [ITMOs]), followed by low-level direct linkages with conditional features in the form of quota limits or exchange rates on foreign credits. Incremental steps could culminate in high-level linkages, where countries enter into mutual MOUs or legally-binding treaties.
- Significant efforts are needed to advance linkage in a manner that preserves environmental integrity and avoids a wide range of loopholes, which could cause a race to increase (loosen) national caps or intervene in carbon markets to control prices.

**Jackson Ewing:** ***Prospects for Carbon Market Cooperation in Northeast Asia***

- The major economies of Northeast Asia are shifting the locus of future carbon-market activity to the east. China, Japan, and the Republic of Korea (Korea) will continue to prioritize their domestic carbon-market development, while testing the technical and political foundations for future market connections.
- Challenges to carbon-market linkage abound, including differences in economic systems and market designs, along with political and diplomatic barriers.
- Recent scholarship suggests these challenges are technically surmountable. However, meeting these challenges will require deliberate steps by Northeast Asian countries during the formative 2018–2020 period, during which the longer-term landscape of carbon pricing in Northeast Asia will be shaped.
- Efforts by Northeast Asian countries to vet regional linkage prospects can yield ancillary diplomatic and environmental dividends.

**Alistair Ritchie and CJ Park:** ***Recommendations for Linkage in Northeast Asia***

- Despite their geographic proximity and similar industrial structures, it seems to be taking longer than expected to facilitate linkages between the national and sub-national climate policies of three Northeast Asian countries: China, Japan, and the Republic of Korea (Korea).
- Based on expected developments in China and Japan, linking carbon markets in this region is unlikely to be feasible before the mid- to late-2020s. In the meantime, there are already more feasible and mature potential linkage partners for Korea's Emissions Trading Scheme (K-ETS) — for example, the EU ETS and California's cap-and-trade program.
- Incremental approaches to linking are more suitable for the Northeast Asian region than comprehensive, formal approaches. As a key step before initiating formal talks on linkage, countries should seek to ensure that their national policies are "linkage ready," through incremental alignment with relevant ETS building blocks and with future international rules under the Paris Agreement.
- Two practical actions to advance linkage readiness include: 1) forming technical working groups to share experience, to discuss challenges to specific elements of linkage, and to consider how to meet these challenges; and 2) cooperating with partner countries to assess linkage options, with the help of impact-assessment-modelling teams.

## Cooperation through Linkage of Policy Systems

### —Linkage and Article 6 of the Paris Agreement

**Michael A. Mehling, Gilbert E. Metcalf, and Robert N. Stavins:** ***Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)***

- International linkage of regional, national, and subnational climate policies could play an important role in supporting the ramp up of ambition in Nationally Determined Contributions (NDCs) over time — including, over the longer term, in East Asia — and so contribute to the success of the Paris Agreement.
- Linkage has the potential to lower overall costs of mitigation, given the wide range of marginal abatement costs across countries, and also can lower administrative costs of compliance and help build political momentum, both of which can contribute to scaling up ambition.

- The bottom-up nature of the Paris Agreement has led to great heterogeneity of NDCs, which can pose challenges for linking. These challenges are not insurmountable, but will require thoughtful guidance for the effective operation of key provisions for linking in Article 6 of the Paris Agreement.
- Article 6 guidance can facilitate linkage by, among other things, providing clear definitions and principles for internationally transferred mitigation outcomes (ITMOs), taking into account the heterogeneous nature of NDCs, while avoiding restrictive criteria that could impede effective linkage.

**Lingshui Mo and Xuedu Lu:** ***Asia-Pacific Carbon Market Linkage under the Paris Agreement: Modality and Key Issues***

- Linking Asia-Pacific carbon markets is important to cost-effectively reduce regional greenhouse gas (GHG) emissions and advance global efforts to achieve long-term targets for climate-change mitigation. The Paris Agreement builds an international political foundation for linking carbon markets.
- Domestic carbon markets are emerging in the Asia-Pacific region. These markets are in different modalities and stages of operation. Carbon-market cooperation has been ongoing at technical level.
- The modality and level of initial carbon-market linkage needs to reflect the existing state of domestic carbon-market development in participating countries.
- Carbon-market linkage among Asia-Pacific countries should be established consistent with the requirements of the Paris Agreement. Harmonization of technical standards, capacity building, and political support are required to build up regional linkage.

**Fei Teng:** ***Linking NDCs through Article 6 of the Paris Agreement***

- The bottom-up approach of the Paris Agreement has proved a success in terms of participation, but also faces challenges with respect to ambition and cost effectiveness.
- Market mechanisms in Article 6 can help to improve the cost effectiveness of the Paris Agreement, but political barriers need to carefully addressed, especially as they relate to the comparability of NDCs and interaction with "nationally determined" characteristics.
- The Facilitative Dialogue in 2018 can be an opportunity to provide political momentum for negotiations on market mechanisms and allow more progress in negotiations at the technical level.

## Non-Market (and Modified Market) Approaches to International Cooperation

**Ziting Huang and Junjie Zhang:** ***Developing Non-Market Approaches through Regional Cooperation Platforms***

- Regional cooperation platforms in Asia can develop important non-market approaches to help Asian countries achieve their Nationally Determined Contributions (NDCs).
- With increasing trade intensities among Asian countries, the ambition of regional mitigation and adaptation policy can be enhanced by linking climate policies to regional trade and investment.
- China's Belt and Road (B&R) Initiative needs to include mechanisms to prevent participating countries from being locked into carbon-intensive infrastructure and manufacturing.

**Suh-Yong Chung:** ***Status and Prospects for Article 6 of the Paris Agreement: Implications for Cooperation in East Asia***

- Article 6 of the Paris Agreement provides incentives for cooperation among nations in implementing their Nationally Determined Contributions (NDCs).
- Although several East Asian countries, including the major emitting nations of China, Japan, and South Korea, have piloted or are implementing emissions-trading schemes (ETSs), a fully linked East Asian (or Northeast Asian) carbon market is probably not feasible in the near term.
- Rather, East Asian countries could use incentive mechanisms under Article 6 to promote regional cooperation on issues such as renewable energy, deforestation, and other low-carbon development opportunities — possibly by forming a regional climate club.
- Such cooperation has the potential to generate significant volumes of internationally transferred mitigation outcomes (ITMOs) that can be used to help East Asian countries achieve their NDCs, while also laying the groundwork for further regional cooperation and eventual carbon market linkage.

**Suzi Kerr, Ruben Lubowski, and Robert Heilmayr:** ***Climate Teams: A New Model for Investor-Host Climate Cooperation***

- Some countries are willing to transfer significant resources to increase the speed of others' transition to zero net carbon emissions. No effective, credible international mechanism that can be applied to emission reductions in all sectors currently exists to do this, but the cooperative approaches of Article 6.2 of the Paris Agreement provide space for innovation.
- A "climate team" offers one model to enable host (low marginal cost) and investor (high marginal cost) countries to cooperate to genuinely reduce global emissions and enable more ambitious Nationally Determined Contributions (NDCs) in both.
- A large (national- or jurisdictional-) scale climate team agreement can more easily demonstrate additionality of mitigation and avoid leakage. Such an agreement can take advantage of existing commitments (NDCs as a basis for crediting baselines) and monitoring (national inventories), thereby increasing transparency and reducing administrative costs.
- Transformational change requires significant policy changes and large investments, which can be both economically and politically costly. The climate team model gives the host country confidence that it will receive an acceptable return if it successfully reduces emissions.

**Valerie J. Karplus:** ***Air Quality Co-benefits and the Design of $CO_2$ Emissions Pricing in East Asia***

- Policies targeting reductions in air pollutants and carbon dioxide ($CO_2$), a major greenhouse gas, interact because both affect fossil fuel use in energy-intensive industries, including electric power and heat, iron and steel, and cement production.
- By transferring $CO_2$ emissions-reduction obligations from high- to low-abatement-cost emitters, $CO_2$ emissions pricing can change the spatial pattern of local air pollution emissions in ways that increase or decrease related health effects of short-lived localized air pollutants. In linked pricing systems, this spatial redistribution may occur across regional or national borders.

- There is large potential for climate policy in mainland China to achieve local air-quality co-benefits, given that most cost-effective $CO_2$ abatement opportunities, which involve reducing coal use near populous inland cities, would result in significant reductions in emissions of local air pollutants — sulfur dioxide ($SO_2$) and nitrogen oxides ($NO_X$).
- As developed Asian economies consider linking their $CO_2$ emissions-pricing systems to China's national system, estimates of domestic air-quality co-benefits — due to reduced emissions from both local and cross-border sources — should be assessed and included in comparisons of policy options.
- Reliable and transparent data collected by continuous emissions-monitoring systems for both $CO_2$ and localized air pollutants will be important to assess performance and update policy over time.

**Philip Andrews-Speed:** ***Electrical Power Connectivity in East Asia***

- Electricity interconnection between countries across a region can bring several benefits. In the context of non-market mechanisms to reduce greenhouse gas emissions, the most important of these benefits is the opportunity to transmit electricity from countries rich in renewable energy resources to those that are reliant on fossil fuels.
- To date, most transboundary electricity interconnections in East Asia have been constructed on the basis of bilateral arrangements to transmit electricity from specific power generation projects. Most of these interconnections lie in South East Asia. Interconnections in Northeast Asia are poorly developed by comparison.
- Multilateral trading offers the opportunity for more flexible trading between a larger number of actors and to reduce system costs. The potential for such multilateral trading is being actively explored in South East Asia, within both the Association of Southeast Asia Nations (ASEAN) and the Greater Mekong Subregion (GMS).

# NATIONAL POLICIES AND PERSPECTIVCES

# Policy Initiatives to Address Climate Change in China: An Overview

**Xiliang Zhang**
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## Key Points

- China is formulating policy initiatives consistent with its international pledges and national targets for addressing climate change.
- Institutions will need to be established to create effective political incentives for local leaders to pay attention to addressing climate change.
- The role of market-based policy instruments in mitigating climate change should be extended.

## Introduction

This brief describes three levels of policy initiatives to address climate change in China: international pledges, domestic legally binding targets, and implementation mechanisms or specific institutional arrangements and policy instruments.

## International pledges

China announced its first international pledge to address climate change at the Fifteenth Conference of the Parties of the United Nations Framework Convention on Climate Change, held in 2009 in Copenhagen. The pledge had two parts: 1) To lower carbon dioxide emissions per unit of GDP (in other words, lower the carbon intensity of the economy) 40% – 45% below the 2005 level by 2020; and 2) to increase the share of non-fossil fuels (renewables and nuclear) in China's primary energy consumption to around 15% by 2020.

China's second pledge to address climate change was expressed in its Nationally Determined Contribution (NDC) in 2015, under the Paris Agreement. The major commitments in China's NDC are: (1) To take actions such that national carbon dioxide emissions peak around 2030 and make best efforts to achieve this peak even earlier; (2) to reduce the carbon intensity of China's economy 60% – 65% relative to the level of 2005 by 2030; and (3) to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030.

Comparing China's two major international pledges, we find that China substantially increased its ambition by committing, in the Paris pledge, to reaching peak emissions by 2030. This commitment indicates that China attaches great importance, not only to continually reducing the carbon intensity of its economy, but also to controlling absolute emissions.

## Domestic legally binding targets

To honor its international climate pledges, China has introduced legally binding targets for addressing climate change in its two national five-year plans for economic and social development. The targets in China's twelfth Five-Year Plan (FYP), covering the period 2011–2015, were: (1) To reduce the energy intensity of the economy (i.e., energy consumption per unit of GDP) by 16% relative to 2010; (2) to reduce the carbon intensity of the economy (i.e., carbon emissions per unit of GDP) by 17% over the same period; and (3) to increase the share of non-fossil fuels in China's primary energy supply to 11.4% by 2015.

Similar targets were set for the thirteenth FYP covering the period 2016–2020: (1) To reduce the energy intensity of the economy by 15% relative to 2015; (2) to reduce the carbon intensity of the economy by 18% over the same period; and (3) to increase the share of non-fossil fuels in primary energy supply to 15% by 2020. It should be noted that the carbon intensity of China's economy had declined by approximately 40% from 2005 to 2015, with an average annual reduction rate of 5%. Meeting the carbon-intensity reduction target of 18% in China's thirteenth FYP would result in a cumulative reduction in carbon intensity of approximately 50% from 2015 to 2020 — much more than the 40% – 45% reduction pledged in 2009.

## Institutional arrangements and policy instruments

China has attached great importance to institutional arrangements in addressing climate change. There is a leading group for this issue in the State Council, composed of the ministers or vice ministers of those governmental agencies that have important roles in addressing climate change: the National Development and Reform Commission, the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Foreign Affairs, the Ministry of Agriculture, and the Ministry of Industry and Information Technology. The leading group, currently chaired by Premier Li Keqiang, oversees national progress in climate change mitigation and coordinates related national initiatives. Leading groups for addressing climate change have also been established at the provincial level with a similar structure and function to the national leading group.

Disaggregating national energy and carbon-intensity reduction targets to the provincial level is an important approach that China's central government has adopted to distribute its national climate obligations. The State Council will conduct a yearly check of progress in energy- and carbon-intensity reductions and evaluate the performance of each province. The results of the progress check and performance evaluation will be publicly released, and the governors of provinces with low performance scores will be warned and urged to step up their efforts by the State Council. At this point, all of the provinces have introduced legally binding energy- and carbon-intensity reduction targets, respectively, in their five-year economic and social development plans. Most of the provinces distribute these targets to the cities under their jurisdiction. Such institutional arrangements create substantial political incentives for provincial and local leaders to pay attention to addressing climate change.

Over the past decade, the Chinese government has adopted a bundle of policy instruments to address climate change, including command-and-control policies, such as fuel economy standards, building energy efficiency standards, and energy performance standards for the energy supply and manufacturing sectors; as well as market-based policy instruments, such as a fossil-resources tax, subsidies for energy-efficiency-investment projects, feed-in tariffs for renewable electricity, and electricity-consumption surcharges for renewable electricity. In addition, the government provides public support for climate-technology research and development.

Since 2013, China has also launched pilot carbon dioxide emissions trading systems (ETSs) in five cities (Beijing, Shanghai, Shenzhen, Tianjin, and Chongqing) and two provinces (Guangdong and Hubei). China announced the official start of its national ETS on December 19, 2017. It largely mirrors the government's increasing focus on market-based and least-cost policy instruments to achieve its climate goals since the introduction of economic reforms. China's national ETS starts with the power generation sector and will be extending to seven other sectors (iron and steel, building materials, non-ferrous metal processing, petrochemicals, chemicals, pulp and paper, and aviation) with a total coverage of around 7,000 companies, accounting for approximately one-half of China's energy-related carbon dioxide emissions. The expectation is that the ETS will become the primary policy instrument for mitigating China's carbon dioxide emissions in the near future.

# Climate Change Policy in Japan and the Role of "International Contributions"

**Takashi Hongo**
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## Key Points

- Japan is considering changes to its emission-reduction strategy in light of the difficulty of achieving its 2030 target under the Paris Agreement with a lower contribution from nuclear-power generation.
- Views differ on the role of carbon pricing in Japan: Some analysts have concluded that Japan already has one of the world's highest carbon prices and therefore cannot raise its carbon price without harming the economy, while others point to the need for industrial restructuring to increase value added per ton of carbon emissions in the Japanese economy.
- Emissions trading is viewed with caution in Japan, because of concerns about price volatility and the risk of speculation. However, leverage to achieve additional emissions reductions via an increase in the carbon tax seems to be limited.
- Japan can make an important contribution to international mitigation efforts, by providing public and private support for emissions-reduction activities in other countries and by helping to develop effective quantification and accounting mechanisms in support of broader, cross-national carbon markets and carbon "clubs."

## Japan's greenhouse-gas-reduction targets and the present situation

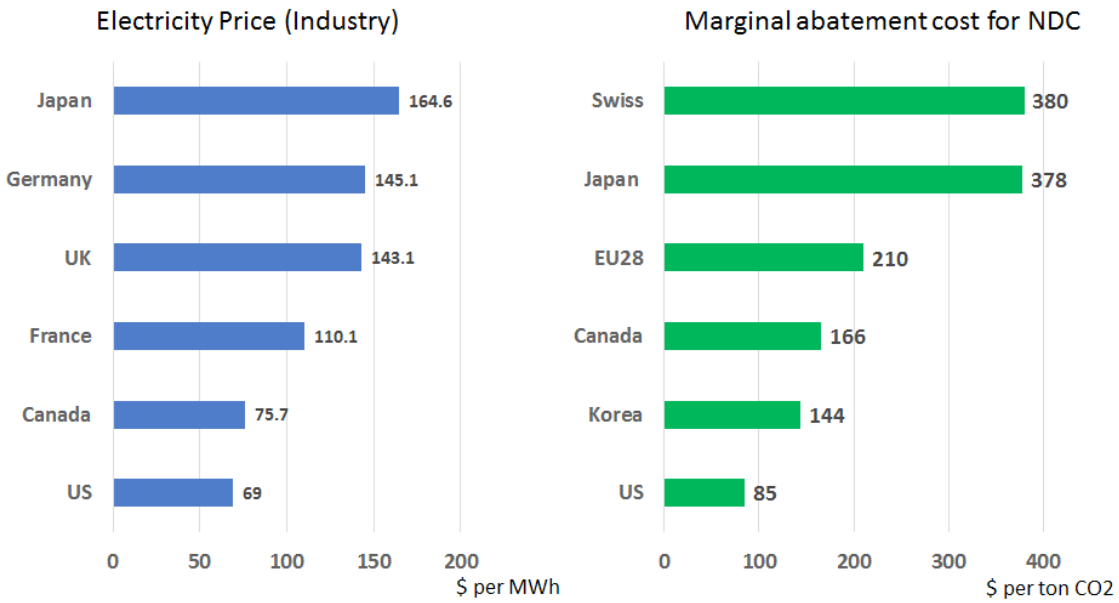
Japan has committed to a 26% reduction in greenhouse gas emissions by 2030 and an 80% reduction by 2050. The 2030 target is based on a national energy plan that calls for zero-emission sources to make up 44% of the overall energy supply and for reducing the emissions intensity of the electric power sector to 370 kg $CO_2$ per MWh.

This plan was adopted after the Fukushima accident in 2011, and it was assumed then that many nuclear power plants would be re-opened. However, the lack of public acceptance of nuclear power will make these targets difficult to achieve. For this reason — and because Japan's renewable energy resources are limited — the 2050 target, in particular, poses difficult challenges. As a result, Japan is considering how to reform and strengthen its emissions-reduction strategy. Three key issues are currently receiving policy consideration.

## Carbon pricing

In discussions of carbon pricing, it is useful to distinguish between the "explicit price" and the "implicit price." Carbon taxes and emissions-trading programs generate an explicit price, while implicit pricing arises from numerical standards or other regulations. Some analyses indicate that Japan's current carbon cost (e.g., electricity price including carbon cost) and Japan's marginal abatement cost to achieve its 2030 target are already at the highest level in the world. (See Figure 1.) Against this background, there is a broad opinion that Japan should not take further carbon-pricing measures.

## Figure 1: Electricity prices and marginal abatement costs




Source: Ministry of Economy, Trade and Industry. Original data is at P48 and P49 of the documents below.
http://www.meti.go.jp/committee/kenkyukai/energy_environment/ondanka_platform/pdf/003_s01_00.pdf

Other studies that have focused on "carbon productivity" — as expressed by economic output (GDP) per ton of $CO_2$ ($tCO_2$) emissions — have found that Japan's carbon productivity is around \$4,000/$tCO_2$, not particularly high compare to other countries like Norway and Sweden (over \$10,000/$tCO_2$), and has not improved over the last 20 years. Between 1995 and 2014, the United States improved from \$1,000/$tCO_2$ to \$2,000/$tCO_2$, and China and India improved from \$500/$tCO_2$ to \$10,000/$tCO_2$.[1] This finding leads some analysts to conclude that Japan must reform its industrial structure to transition to a low-carbon economy.

1 Ministry of Environment. "Long-term low-carbon vision; reference materials." p. 69. http://www.env.go.jp/press/y0618-12/mat04.pdf.

## Carbon taxes and emissions trading

There is vigorous debate about which policy mechanism, taxes versus trading, would be more practical and effective for achieving further $CO_2$ reductions in Japan. Some are concerned that emissions trading could result in high price volatility, which would have negative impacts on the economy and dampen innovation. With respect to a carbon tax, there are questions about whether higher energy prices (boosted by the tax) — or using revenues from the tax to incentivize deployment of low-carbon technologies ("revenue boost effect") — will be sufficient to reduce emissions as much as many experts suggest is necessary or desirable. When the Global Warming Tax was adopted in Japan in 2012,[2] the Ministry of Environment released an analysis of its impacts on emissions; a tax (JPY 289/t$CO_2$) will reduce Japanese emissions by 0.2% through higher energy prices and 0.4 – 2.1% through the revenue boost effect.

If Japan adopts emissions trading, the result will be "cap and offset" (rather than "cap and trade"), because Japan's higher marginal abatement costs will make it less costly to use international offset credits to achieve compliance under a national trading program. In this scenario, however, the potential for "leakage" would have to be carefully considered.

## International contributions

The consensus view in Japan is that greenhouse-gas emissions will have to be reduced globally. Japan can support international mitigation efforts in two ways: (1) by creating incentives for emissions reductions by purchasing international offset credits; and (2) by financing efforts in other countries and by quantifying and accounting for reductions achieved through those efforts. Key issues for international offset credits include the need to avoid double counting and the need to make "corresponding adjustments" in the emissions accounts of participating countries under the Paris Agreement.

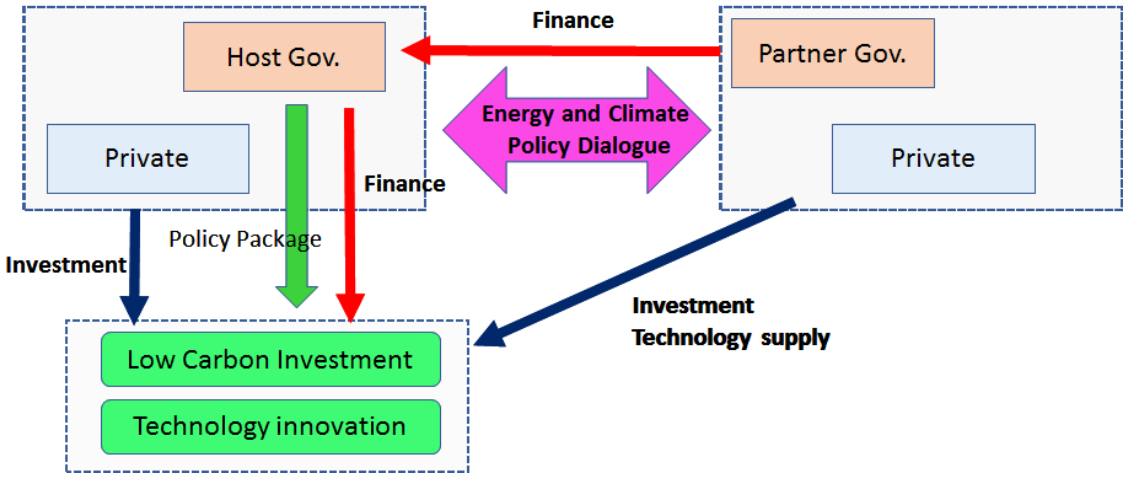
International emission trading can reduce the economic costs of mitigation measures, but it cannot capture 100% of the emissions-reduction potential associated with activities such as improving the efficiency of home appliances or accelerating the diffusion of low-carbon materials or technologies. However, quantification and accounting approaches can be more flexible and can encourage additional abatement activities. The remainder of this brief discusses how to distinguish and account for contributions to international emissions reductions.

One possible mechanism for scaling up international emissions-reduction activities is hybrid finance. Conventional support mechanisms provide incentives for emission-reduction projects, but investment in these projects typically stops once the incentive mechanism is terminated. The proposed approach is to focus on improving the investment climate for emission reductions. In the hybrid finance approach, governments first engage in dialogue to set energy

2 Ministry of Environment. http://www.env.go.jp/policy/tax/about.html.

and climate policies. Financing to set regulations and support compliant projects follows. Outcomes should be subject to measurement, reporting, and verification (MRV). Combining hybrid finance with outcome/performance financing is an option.

## Figure 2: Concept of hybrid finance




Another option is to develop broader carbon markets. In North East Asia, trade and cross-border investments between ASEAN nations are very active and expected to increase in the future. Industries and corporations are optimizing their operations on a consolidated basis. Emissions trading provides flexibility for this process of optimization and creates demand for cross-border carbon trading. Article 6 of the Paris Agreement provides a foundation for international transfers of mitigation outcomes, including bilateral and regional transfers. Guidance for the implementation of Article 6 is planned to be completed at COP-24 in 2018, but there is a risk of delay. Bottom up approaches to regional cooperation, such as carbon clubs, may push the negotiations forward and also reduce the risk for early movers.

## Figure 3: Carbon clubs

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| Strengths<br>✓ Cross border trade and investment is growing, but carbon cost is traded implicitly.<br>✓ New carbon market is emerging in China, Korea, Japan, and ASEAN<br>✓ Paris Agreement includes bilateral/ national scheme in addition to UN centralized scheme. | Weakness<br>✓ Difference of energy and climate change policy, in addition to economic and industry structure.<br>✓ Less flexible than national scheme.<br>✓ Lack of regional framework, such as in EU and NAFTA. |
| Opportunity<br>✓ Push UNFCCC negotiation and reduce political risk of independent market under Paris Agreement.<br>✓ Improve market stability and reduce carbon cost under different jurisdictions.<br>✓ Push regional economic cooperation and improve political stability. | Threats<br>✓ Some participants insist on using CDM or UN centralized mechanism (e.g., Art. 6.4).<br>✓ Earlier start of new integrated UNFCCC market and reduce the space for carbon club(s).<br>✓ Collapse of Paris Agreement or losing the momentum of low carbon transition. |

## Conclusion

I recommend the following principles to guide Japan's long-term climate strategy:

1. **Multi-faceted approach to reduce climate externalities:** Pricing carbon is generally recommended to internalize climate impacts. However, a carbon tax is better suited to addressing the contribution from smaller emitters, and emissions trading can be effective for large-scale emitters. There is no one-size-fits-all approach to climate policy, so a combination of carbon taxes, emissions trading, and conventional regulations, in addition to incentives, is practical.

2. **Small government:** Government support is often needed to jump-start low-carbon investment, but a phase-out strategy should be prepared from the beginning. Mitigation outcomes should be monitored using standardized MRV mechanisms, and the cost performance of different programs and policies should be evaluated with the aim of continually improving incentive mechanisms. Subsidies for R&D investment are common, but well-designed regulations will also stimulate innovation.

3. **Global approach:** Cross-border trade and investment activity is growing and becoming increasingly global, as companies seek to optimize their business operations worldwide. International transfers of mitigation outcomes and/or allowances can be a cost-effective option for achieving national climate commitments. Carbon clubs and hybrid finance are potentially useful instruments for accelerating global mitigation efforts.

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# International Cooperation on Climate Policy from the Japanese Perspective

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## Key Points

- Japan has failed to adopt a national-level emissions trading scheme (ETS), but some local jurisdictions have done so.
- International cooperation on climate policy not only brings economic benefits to Japan, but it also energizes the stagnant climate-policy environment in Japan.
- To promote international cooperation on climate policy, however, Japan will need to resolve issues such as equity in Nationally Determined Contributions (NDCs) and the quality of measurement, reporting, and verification (MRV) under the Paris Agreement.

## The current status of climate policy in Japan

The need to reduce greenhouse-gas (GHG) emissions is urgent. Under the Paris Agreement, more than 160 countries agreed to take ambitious steps toward "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels." Thus, developing and emerging economies — in addition to developed ones — must control GHG emissions. The Japanese government announced an emissions-reduction target of 26% below 2013 levels by 2030. In addition, the government announced an 80% reduction target by 2050. Achieving this goal will require both innovation and investment.

At the national level, Japan has failed to adopt either an ETS or a carbon tax ambitious enough to substantially reduce GHGs. At the sub-national level, however, Japan has successfully implemented cap-and-trade schemes. In Japan, two local jurisdictions (Tokyo and Saitama) have adopted such schemes. The Tokyo ETS has reduced GHG emissions more than required in Phase I, which lasted from 2010 to 2014 (Arimura and Abe 2017).

Since Japan has no national-level ETS, linking its domestic emissions-allowance market to a foreign one would have to involve the market of a local jurisdiction that has already introduced an ETS. The Tokyo and Saitama ETSs, however, have already reduced emissions more than expected, leaving these markets with excess allowances. Given Japan's current (modest)

national reduction target under the Paris Agreement, there is little necessity to trade emission allowances with other countries at this stage.

## International cooperation on climate policy: the view from Japan

As explained above, the likelihood that Japan will link its emissions allowance market with foreign markets in the near future is not high. However, international cooperation, including linking emissions markets, can benefit Japan and its partner countries in several ways. First, if the Japanese government imposes more stringent reduction targets in the future, Japan will benefit greatly from emissions trading with other countries, because more stringent targets will make the marginal abatement cost in Japan very high. In addition, it is very likely that the Japanese government's current plan to use nuclear power to some extent in the future will not be realized. In that case, Japan could greatly benefit from international trading of emissions allowances.

Second, Japan can share lessons learned from its largely successful sub-national cap-and-trade systems with developing economies. Developing economies can use cap and trade to control their emissions (and achieve their Paris commitments) cost effectively, before they lock in less energy-efficient technologies in energy-intensive industries.

Third, Japan can help developing economies by directly supporting the diffusion of energy-efficient technologies. The Japanese government's Joint Crediting Mechanism (JCM) can help drive the diffusion of energy-efficient or low-carbon technologies, products, or systems in developing economies. The Japanese government, in collaboration with host countries, chooses appropriate projects and provides subsidies. Both Japan and the host country can obtain emission-reduction credits, which can be used to achieve emission-reduction targets under the Paris Agreement. The size of the budget for JCM, however, is not large enough to have a sizable impact on the emissions of host countries. The Japanese government should expand the budget for JCM.

Fourth, cooperation with foreign countries can strengthen climate change policy in Japan. In Japan, there is large variation in motivations for climate-change policy across regions. For instance, concerns about carbon leakage make it difficult for ambitious regions to strengthen their carbon regulations. In this case, ambitious domestic regions can stimulate action in other, less ambitious regions by cooperating with foreign ambitious regions such as California or the northeastern states in the United States. Thus, international cooperation can be a trigger for activating stagnant climate policy in Japan.

## Issues that need to be considered in promoting international cooperation on climate policy

The first issue to be considered is related to equity in NDCs. Japan is likely to gain economic benefits when participating in international emissions trading. However, in Japan, there is strong opposition to purchasing emissions allowances that are regarded as hot air. In addition, even if foreign allowances are not hot air, emissions trading is likely to be regarded as unfair, absent some degree of equity in the NDCs of participating countries. Specifically, a situation where regions with significantly lower NDC targets sell emissions allowances would be regarded as unfair. Patterns of trade in emissions allowances will depend strongly on the level of NDCs. Without equity across NDCs, emissions trading will not be considered fair, which will in turn suppress international cooperation. Although there are some advantages in the current rule that NDCs are voluntarily decided by each country, it seems preferable to set some criteria for deciding reduction targets to promote international cooperation.

A second issue is the quality of MRV. To exchange emissions internationally, MRV is essential. Unless MRV is properly conducted, the legitimacy of internationally transferred mitigation outcomes (ITMOs) is not guaranteed. However, there are large differences in the quality of MRV across countries. Japanese firms and MRV organizations are confident in the quality of MRV in Japan, but they are skeptical of MRV quality in other countries, especially in developing countries. This leads to skepticism about ITMOs as well. To promote ITMOs, mechanisms must be established to ensure a certain level of MRV quality.

Finally, the general equilibrium impacts of international emissions trading must be considered. International emissions trading is generally considered to be a desirable policy. This claim is true in a partial equilibrium situation, but it does not necessarily hold in a general equilibrium situation. For example, our research using a general equilibrium model shows that international emissions trading does not necessarily benefit participating regions in a world with unemployment (Takeda *et al*. 2015). Discussions of international trading often consider only the market for allowances. However, such trading affects not only the domestic emissions market but also the economy as a whole, through indirect effects. More attention should be paid to such indirect general equilibrium effects when considering the role of ITMOs.

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# Key Issues for the Korean Emissions Trading Scheme and their Implications for International Linkage Discussions in Northeast Asia

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## Key Points

- One of the most important features of the Korean Emissions Trading Scheme (K-ETS) is that third-party market makers are not allowed to trade in the market.
- Another important issue is that Korean power-market rules have neutralized the fuel-switching incentive provided by a carbon price because they do not allow carbon costs to be reflected in market-bid prices.
- Lastly, uncertainty about Korea's future nuclear- or coal-power mix have been significantly affecting market operation by, for example, delaying second-phase credit allocations.
- The K-ETS is a market-based mechanism in a government-dominated economy. This is one of the reasons why discussions about international linkage have not been picking up as quickly as expected.

## Introduction

The K-ETS covers approximately 68% of the Republic of Korea's (Korea's) national emissions and is currently in the last year of its first phase (2015–2017). Credits are currently trading at around USD 18 to 20 per ton. With the upcoming launch of China's nationwide emissions-trading system, and with the K-ETS entering its second phase (2018–2020), the chances of a regionally linked greenhouse-gas-emissions-trading scheme have become higher. This article looks at three major issues for the K-ETS and their implications for discussions about international linkage of climate policies in Northeast Asia.

## Issue one: K-ETS prohibition on third-party market makers

One of the most important features of the K-ETS is that, except for three government-owned banks (Korea Development Bank, Korea Export Import Bank, and the Industrial Bank of Korea), third-party market makers are not allowed to purchase or trade credits in the market. This prohibition, along with the fact that, until recently, there were no restrictions on banking K-ETS credits, contributed to high credit prices despite overall long markets. As a result, trade volume was only 2.3% of total annual allocations during the first year of the K-ETS (2015). By contrast, during the first year of the EU ETS, the same figure was 34.4% of total allocations.

To contain surging credit prices, the Korean government opted to implement market stability measures (i.e., injecting additional credits into the market) or introduce restrictions on banking, rather than lift the ban on third-party traders. As of now, there still are no clear plans to allow third-party market makers, during the second phase of the K-ETS.

## Issue two: neutralization of carbon price as an incentive for fuel switching in power markets

Pursuant to Korean power market rules, utilities submit bids for their units on an hourly basis to the Korea Power Exchange (KPX), Korea's power market operator. KPX issues dispatch orders beginning with the lowest bidding unit up to the last unit needed to meet projected demand for that hour. The aforementioned power market rules determine which types of costs can be reflected in each unit's bidding price. Unfortunately, carbon credit prices are not reflected in unit bidding prices, which means that carbon prices have no way to provide an incentive for switching to gas-combined-cycle units and away from coal-power plants. Instead, the KPX directly compensates carbon credit prices at roughly the annual average credit price, which eventually means that power utilities will have no motivation to reduce emissions.

## Issue three: lack of clarity concerning national energy policy, which is affecting K-ETS Phase II allocations

Policy confusion with respect to the national government's view of the future role of nuclear and coal power is affecting K-ETS operations. The Korean government's decision, in 2013, to issue permits for seven new coal units made it impossible to maintain emissions at a level lower than its original 2020 national greenhouse gas target of 543 $MtCO_2e$, up to 2030. Subsequently, Korea committed to procure approximately 96 $MtCO_2e$ of international credits to offset the emissions from these new coal plants as part of its Nationally Determined Contribution (NDC) under the Paris Agreement. Discussions about how and whether these international credits will be procured and who will pay for them are ongoing, but a resolution of this issue will need time.

Meanwhile, President Moon Jae-In recently announced the cancellation of several nuclear power units that were originally planned to be commissioned in the 2020s. This will make Korea's NDC, which assumed the new nuclear units would be commissioned, more difficult to meet. Due to uncertainty associated with these decisions, the Korean Government had not yet allocated credits for the second phase of the K-ETS as of November 1, 2017, even though the second phase will begin in January 2018.

## Market-based mechanisms in a "not-so-market-friendly" economy: perspectives on the implications for international linkage discussions

Despite the issues described in this brief, the K-ETS is one of the best-functioning environmental policies in Korea, as enforcement of air-, water-, or land-related pollution policies in Korea has been quite weak in the past. The K-ETS is the country's first nationwide market-based mechanism for reducing emissions and it has succeeded in setting a high price on carbon. The main weakness of Korean environmental policy at present is the absence of a price on air pollution, not the absence of a carbon price.

Nevertheless, the K-ETS is a market-based mechanism in a government-dominated economy that lacks experience with energy or environmental commodities. Korean wholesale and retail power markets are tightly controlled by the government, and private companies are not allowed to participate in major energy markets. (E.g., only government-owned companies are involved in LNG imports or power transmission.) Similarly, the largest Korean banks and emitters (e.g., KEPCO, POSCO) are owned or controlled by the government. Public-sector officials also generally lack private-sector experience — most begin their careers in the public sector and usually remain there until retirement.

This observation gives rise to the question: Why did Korea decide to introduce the K-ETS in 2012, despite its not particularly market-friendly economy? Some say the government considered emissions trading to be an interesting tool and saw opportunities in the carbon market itself. One point of agreement among experts is that not much discussion about the merits of "cap and trade vs. carbon tax" took place before the K-ETS was introduced. Similarly, there was relatively little discussion about the key merits or burdens of an emissions-trading system in general. Ironically, this may be the reason why the Korean government was able to introduce the ETS so quickly, while, at the same time, still hesitating to allow third-party trading. This may also be the reason why there has not been much progress on international linkage.

Nevertheless, the environment for international linkage is changing. A lack of liquidity and rising carbon prices in the K-ETS are creating strong demand in industry for more reasonable credits or offsetting opportunities, including foreign offsets. The Korean government will also need to figure out how it can use international credits to meet its NDC, which will likely involve discussions on international linkage. For these reasons, actual, specific, and high-level discussions on the pros and cons of linkage are slowly beginning within the Korean government.

# COOPERATION THROUGH LINKAGE OF POLICY SYSTEMS

## –Prospects for Linkage of Market Mechanisms in East Asia

# Possible Linkage among Emissions Trading Systems in East Asia

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## Key Points

- Due to the scale of greenhouse gas emissions and the enormity of the mitigation challenge to avert dangerous levels of global climate change, individual carbon markets in East Asia and the possibility of linking these markets in the future have attracted international attention.
- Incremental steps to linking carbon markets in East Asia should now be considered. Such steps could include, first, indirect linkages that use internationally or mutually recognized credits (possibly Internationally Transferred Mitigation Outcomes [ITMOs]), followed by low-level direct linkages with conditional features in the form of quota limits or exchange rates on foreign credits. Incremental steps could culminate in high-level linkages, where countries enter into mutual MOUs or legally-binding treaties.
- Significant efforts are needed to advance linkage in a manner that preserves environmental integrity and avoids a wide range of loopholes, which could cause a race to increase (loosen) national caps or intervene in carbon markets to control prices.

## Carbon markets in East Asia

Carbon-pricing mechanisms have gradually emerged in East Asia, but remain at an early stage of development. Thailand is implementing a voluntary market; Singapore is developing a carbon tax; and Indonesia, Vietnam, India, and Sri Lanka are interested in developing domestic carbon markets. Countries in Northeast Asia are slightly ahead in developing carbon pricing mechanisms. The Republic of Korea (South Korea) launched a nationwide emissions trading scheme (K-ETS) in 2015, but it continues to be modified.

After experimenting with seven sub-national ETSs for 2-3 years, China launched a nationwide carbon market on December 19, 2017, focusing initially on the power sector. Japan introduced a carbon tax in 2012, but is still debating the adoption of a national ETS. (Japan currently has two operating sub-national ETSs, in Tokyo and Saitama.) Because these countries together

account for more than 25% of global greenhouse gas emissions, their national-level efforts to develop carbon markets and the potential to link these markets have attracted international attention.

## Potential benefits and costs of linking

Theoretically, linking carbon markets offers a variety of advantages, including creating larger trading volumes, ensuring market efficiency and liquidity, reducing overall mitigation costs, reducing price volatility, and helping address concerns about carbon leakage. Linkage not only results in a more robust price signal, but it can also produce public health co-benefits, since many carbon mitigation actions also diminish other types of emissions that contribute to local and transboundary air pollution.[1]

Of course, policy differences and related concerns will pose potential barriers to linkage in some jurisdictions. Planned or existing ETSs in this region differ in terms of their scope and design. In South Korea, the ETS is a key component of the country's climate policy, and is therefore broad in its scope of coverage. In China, the ETS is also the most important mitigation policy, but it is — at least initially — much more limited in scope than South Korea's system. Meanwhile, Japan is relying on carbon taxes and its Joint Crediting Mechanism, and has adopted trading systems only at the sub-national level. In all three countries, procedures for recognizing international offset credits have not been developed as of yet, but domestic offsets are allowed and encouraged.

The impacts of linking, whether negative or positive, will be greater for the smaller of a pair of participants. Currently, allowance prices in South Korea and Japan are higher than in China's seven pilot ETSs. According to Zhang and Yao (2016), the initial carbon price in China's unified national ETS will be about 30 yuan per ton until 2020. This estimate, which is lower than the current price of 40-50 yuan in China's sub-national ETSs, reflects the expectation that early allowance allocations will be generous under the new national system.

By contrast, allowance prices are unlikely to fall below current levels in the second phase of Korea's ETS or in Japan, given that most low-cost mitigation options in Tokyo and Saitama have already been exploited. This suggests that South Korea and Japan would likely be buyers in a linked East Asian carbon market. South Korea, in particular, is likely to be a major buyer, at least until 2030; its allowance prices are expected to be among the highest in the world. If the domestic carbon price is greater than the carbon price in a linked market, South Korean firms will have strong incentives to support linkage so that they can rely on cheaper foreign allowances for compliance purposes.

1 On local co-benefits, see also brief in this volume by Valerie Karplus.

Political considerations can be a critical trigger to hasten the process of linking; at the same time, political considerations can also get in the way of harmonizing market features, creating institutional frameworks, or implementing linkage mechanisms. Individual carbon markets are typically designed to be autonomous with respect to key features such as target emissions (the cap), management of carbon prices, and systems for measurement, reporting, and verification (MRV).

## Steps to linkage

Asian countries are currently focused on developing, testing, and adjusting domestic carbon markets. As mentioned in Ewing (2016), the first step to eventual linkage should be for national governments to make their existing ETSs linkage-ready. Efforts to adopt international carbon pricing mechanisms and establish key connectivity principles for MRV, emission crediting, and tracking will be part of this first step. Other near-term efforts to advance linkage could include frequent formal and informal meetings, and information exchanges on policy and technical issues, with the participation of sector stakeholders, in order to work toward harmonizing and recognizing uniform approaches and compatible standards.

In the medium term, countries that aspire to participate in international carbon markets need to conduct research to learn how homogeneous or heterogeneous types of domestic markets could be connected in an incremental manner, employing discrete steps:

- Indirect linkage via internationally or mutually acceptable offset credits at the early stage.
- Low-level direct linkage that features direct but conditional provisions for quota limits and exchange rates on foreign credits and selective harmonization of standards, emissions accounting, and trading principles.
- High-level linkage based on mutual, legally binding agreements. (This step represents the highest degree of market integration with fully harmonized accounting standards, credits, and compliance rules.)
- Finally, nations could partner to take incremental steps, bilaterally or multilaterally, from operating pilot linkages to entering into more formalized linkage arrangements through mutual MOUs or legally binding treaties.

## Concerns

Significant efforts are needed to build trust and establish linkages that protect environmental integrity and avoid a wide range of regulatory loopholes, which could otherwise lead to a race to increase national caps or intervene in carbon markets to control prices.

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# Prospects for Carbon Market Cooperation in Northeast Asia

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## Key Points

- The major economies of Northeast Asia are shifting the locus of future carbon-market activity to the east. China, Japan, and the Republic of Korea (Korea) will continue to prioritize their domestic carbon-market development, while testing the technical and political foundations for future market connections.
- Challenges to carbon-market linkage abound, including differences in economic systems and market designs, along with political and diplomatic barriers.
- Recent scholarship suggests these challenges are technically surmountable. However, meeting these challenges will require deliberate steps by Northeast Asian countries during the formative 2018–2020 period, during which the longer-term landscape of carbon pricing in Northeast Asia will be shaped.
- Efforts by Northeast Asian countries to vet regional linkage prospects can yield ancillary diplomatic and environmental dividends.

## Introduction

The major economies of Northeast Asia are shifting the locus of future carbon-market activity to the east. Whether they do so in coordination or on independent tracks will depend on the actions they take during the imminent phases of their market development. Impetuses for cooperation and linkage exist in tandem with barriers. China, Japan, and Korea will retain their respective domestic priorities, while gradually — often tepidly — testing the technical and political foundations for future market connections.

China's December 2017 launch of a national emissions trading system (ETS) was both symbolically and materially meaningful. Symbolically, it reaffirmed China's commitment to climate action in the face of the U.S. federal government's backsliding, and bolstered arguments that carbon markets should play core mitigation roles in major developing economies. Materially, it expanded emissions under regulation, and put a foundation in place for further coverage in the future. These are true despite China's soft-launch approach and greatly-reduced ambition as planning has proceeded (Reclev 2017; Slater 2017), but the modest initial scope does make it critical that China's ETS evolve in a constructive manner.

Korea is transitioning from Phase I to Phase II of its Korean ETS (K-ETS), which will see the country expand coverage, scale-up auctioning, and ultimately enable international offsetting. Japan's sub-national schemes in Tokyo and Saitama are consistently meeting their targets (arguably in part because of modest ambition [Ewing and Shin 2017, 28-29]), as the country operates additional voluntary market mechanisms and explores avenues for scaling-up its international offset program.

The apparent alignment of these trends is rekindling calls and actions for carbon-market cooperation and linkage initiatives in Northeast Asia. There was consistent open- and closed-door dialogue throughout 2017 by regional experts and practitioners and their international counterparts on cooperation and linkage. This momentum fed into a Second Forum on a Carbon Pricing Mechanism, held in Seoul in December 2017, to gather regional experts with official sanction and participation of Chinese, Japanese, and Korean governments. If advocates of regional carbon market cooperation are successful, the issue will find a place on the agenda of the next official trilateral summit — likely in April 2018.

However, there are more questions than answers about whether and how regional cooperation will deepen, and what types of linkage — if any — will prove palatable to regional policymakers. Equally important, given the accelerating climate crisis, there is no convergence on the timeline for accelerating cooperation, much less linkage. China, Japan, and Korea are therefore at a crossroads at which exploring carbon market cooperation can proceed — albeit cautiously — and become more robust, or be pushed further to the background by domestic considerations. The direction taken will determine whether carbon-regulation policies are integrated into wider regional relationships, or left uncoordinated and disparate.

## Benefits and barriers to cooperation

The potential benefits of carbon-market cooperation are well documented conceptually (Bodansky *et al*. 2014; Mehling *et al*. 2017), and specifically for Northeast Asia (Ewing 2016; ADB 2016). Linking Asian markets would widen the range of emissions reduction options, some of which will be cheaper than those which emitters can currently access, and help provide the scale and liquidity needed for more robust trading. As mitigation costs go down with trading, national levels of climate ambition could go up.

Such links would also reflect the economic connections that define much of Northeast Asia, and disincentivize the leakage of emissions to jurisdictions with less stringent climate policies. Even cooperation that stops short of actual linkage could lead to greater transparency, capacity gains, and the integration of carbon-regulation policies into wider diplomatic considerations on trade, economic relations, and transboundary environmental challenges, among other issues.

Linkage would also bring greater complexity, and could amplify the design and operational challenges that already frustrate domestic markets in Northeast Asia. Critics of linkage argue that it makes markets more unwieldy and volatile, and that carbon markets work best under a single dominant entity free from regulatory competition (Cullenward and Coghlan 2016; Green 2017). The different economic and financial systems in China, Japan, and Korea make it difficult to create recognized, at least partially fungible, credits across these boundaries. Political and strategic considerations can make credit purchases across these borders problematic, unless these credits come to be viewed as established, tradable, commodities — which is not yet uniformly the case. Meanwhile, cooperation that stops short of linkage, such as cooperative offset programs, harmonization of MRV systems, and converging positions on implementing the Paris Agreement carbon market statutes (Article 6.2 and 6.4), must come to be viewed as tracks worth prioritizing.

China, Japan, and Korea each experience these barriers in varied ways. China's natural caution with regard to policy innovation, long-view, and tendency to under-promise and over-deliver (e.g., the government consistently sets solar, wind, and natural gas expansion targets they are poised to significantly overrun) means that it will continue to prioritize domestic progress prior to meaningful linkage conversations.[1] Its primary structural barrier to regional links is its choice to use tradable performance standards (TPSs) rather than emissions credits under an absolute cap. As TPSs stem from efficiency gains rather than aggregate emissions reductions, this creates technical challenges for linking to more conventional markets.

Japan's lack of a mandatory national market places it on a different footing than its regional peers, and yields questions about whether voluntary, offset, and/or sub-national markets could effectively enter serious linkage discussions with other national governments. Korea is poised to embrace regional cooperation dialogue in the near term, but must address domestic regulatory uncertainty at home — manifested most recently through the movement of the K-ETS portfolio from the Ministry of Strategy and Finance back to its original home in the Ministry of Environment.

These barriers are real, but recent scholarship has shown that cooperation and linkage can overcome such heterogeneities (Ewing 2016; Mehling *et al.* 2017). Northeast Asia could explore cooperation during the formative phases of the Chinese and Korean markets from 2018–2020, during which Japan will be making key decisions about its carbon market future. Some promising pathways exist.

1 Prominent scholar and Chinese climate negotiator Duan Maosheng often cites 2030 as a date at which China will be ready to explore links (de Boer *et al.* 2017).

## Prospects and pathways

The 2018–2020 period will shape the longer-term landscape of carbon pricing in China, Japan, and Korea, which can pursue the following actions now to build a foundation for more extensive carbon market cooperation in the future[2]:

- Build greater regional transparency and cooperation on monitoring, reporting, and verifying emissions reductions, both to build confidence and as a practical matter;
- Move carbon market cooperation up the agenda of the China-Japan-Korea Trilateral Summit as a means for galvanizing critical political discussions;
- Grow the regional-market-linkage-evidence base in Northeast Asia through targeted research cooperation;
- Collaborate deliberately on the implementation rules for Article 6 of the Paris Agreement;
- Conduct real-time market linkage simulations on regional trading platforms;
- Pilot sub-national market linkages across the region;
- Agree on a prospective date by which to begin official diplomatic discussions on selectively linking their carbon markets — a temporal goal that will help shape the foundation for cooperation while linkage is being built.

These steps are not pathways to linkage, but rather cooperative measures that will provide Northeast Asian countries with a more thorough review of linkage prospects while also potentially paying diplomatic and environmental dividends in their own right. This goal is essential for seeing what is possible in the region.

2 Adapted from Ewing and Shin (2017), pp. 41-42.

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# Recommendations for Linkage in Northeast Asia

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## Key Points

- Despite their geographic proximity and similar industrial structures, it seems to be taking longer than expected to facilitate linkages between the national and sub-national climate policies of three Northeast Asian countries: China, Japan, and the Republic of Korea (Korea).
- Based on expected developments in China and Japan, linking carbon markets in this region is unlikely to be feasible before the mid- to late-2020s. In the meantime, there are already more feasible and mature potential linkage partners for Korea's Emissions Trading Scheme (K-ETS) — for example, the EU ETS and California's cap-and-trade program.
- Incremental approaches to linking are more suitable for the Northeast Asian region than comprehensive, formal approaches. As a key step before initiating formal talks on linkage, countries should seek to ensure that their national policies are "linkage ready," through incremental alignment with relevant ETS building blocks and with future international rules under the Paris Agreement.
- Two practical actions to advance linkage readiness include: 1) forming technical working groups to share experience, to discuss challenges to specific elements of linkage, and to consider how to meet these challenges; and 2) cooperating with partner countries to assess linkage options, with the help of impact-assessment-modelling teams.

## Getting ready for linkage

Common sense argues that countries should consider linking ETSs to reduce GHG abatement costs and adverse competitiveness impacts for industry. First, however, the full, cost-effective abatement potential of a national ETS should be exploited. This requires time to establish, stabilize, and optimize the ETS.

In the context of Northeast Asia, Korea's ETS (K-ETS), with three years' experience, is progressing along this route, while China's ETS has only just started (with a limited initial sectoral scope), and Japan's ETS is much further behind. Thus, it appears it will take longer

than expected to facilitate links between national ETSs in this region, despite these countries' geographic proximity and similar industrial structures.

The K-ETS implementation plan recognizes linkage as a key element for future development, anticipating readiness for linkage by the third phase of implementation (2021–2025). In the first two phases, Korea expects to gradually increase international cooperation through the EU-Korea ETS project,[1] the Korea-China-Japan Cooperation Forum, and bilateral cooperation projects and agreements. This will allow time for key ETS building blocks to become operationally proven and effective, and for Korea's carbon market to become activated and stabilized, such that the carbon price reflects fundamentals of supply and demand.

However, in a country like Korea, with a government-controlled power sector, optimizing an ETS requires more steps than would be typical in the West. Policy constraints that prevent fuel switching in the power sector should be removed to allow the full range of cost-effective GHG mitigation options to be deployed, and simple mechanisms for passing carbon costs through to electricity end-users should be established to enable the price signal to work more effectively.

## Options for linking

If national ETSs in China and Japan follow a similar development path to Korea, then Northeast Asian carbon market linkage is unlikely to be feasible before the mid- to late-2020s. In particular, the huge scale of China's ETS means that achieving a trusted monitoring, reporting, verification and accreditation (MRVA) system will take much more time and effort than in a smaller country such as Korea, which already had strong MRVA systems in place as a result of its predecessor Target Management System (TMS) policy. In the meantime, there are more feasible and mature potential linkage partners for the K-ETS — for example, the EU ETS and California's cap-and-trade program. As such, forming a Northeast Asian carbon market is not an obvious initial step.

Based on a review of the current and projected global ETS landscape, a set of linkage options or packages should be developed, taking into account potential differences with respect to types of links, scope, scale-up rate, and other factors.

## Assessment of linking options

Efforts to assess linkage options against a "business-as-usual" base case scenario should follow the usual impact assessment process and consider several factors:

- Effectiveness — for example, in achieving ambitious NDC targets, in supporting the achievement of global GHG mitigation targets, in avoiding carbon leakage, in ensuring the integrity of emissions caps, in implementing the ETS, and in activating and stabilizing the carbon market;

1 http://www.kets-project.eu/en/

- Efficiency — with respect to, for example, financial and economic impacts on regulated entities and nations, and in terms of limiting adverse impacts on competitiveness and competition; and
- Feasibility — in terms of consistency across linked systems with respect to design elements, such as MRVA provisions, offset rules, banking/borrowing rules, cap-setting ambition, and supporting infrastructure.

Impacts on affected stakeholder groups in each partner country, as well as international impacts, will inform the overall comparison of options.

Assessing impacts will require detailed modelling studies, including, for example, "bottom-up" energy-systems modelling and "top-down" macroeconomic modelling. Close cooperation between modelling teams in partner countries will be important.

## Incremental linking through "linkage readiness"

Incremental linking approaches are more suitable for the Northeast Asian region than comprehensive, formal linking approaches. As a key step before initiating formal talks on linkage, countries should seek to ensure that their national policies are "linkage ready" through incremental alignment with relevant ETS design elements (such as those listed above) and with future international rules under the Paris Agreement. Such alignment would be beneficial even absent any consideration of linkage.

These steps can be achieved through technical working groups, composed of experts from each partner country who can share experience, challenges, and solutions on specific elements of linkage. Among others, the most important working group will be the one for MRVA, which might be composed of China and Korea initially, as the MRV system for Japan's Joint Crediting Mechanism (JCM) program is quite different from that of an ETS. However, Japan can participate in an offset working group and discuss with the other two countries how offset mechanisms might be aligned in the region, including with MRVA systems. Cap setting and benchmark-based allocation are other important potential topics for working groups. A useful reference will be the process for information sharing and coordination that exists between the EU and the Swiss Confederation to support links between their ETSs.

Another important next step toward linkage, given its broad and complex scope of impacts and extra political challenges beyond the development of a national policy, would be to develop cooperation across impact-assessment-modelling teams in partner countries. Cooperation could cover modelling methods, data collection, data sharing, and uncertainty/sensitivity analysis, and could include modelling inter-comparison studies to provide a more robust understanding of likely impacts. Cooperation will facilitate greater levels of trust and confidence in impact assessment, more robust analysis, and better decision making.

# COOPERATION THROUGH LINKAGE OF POLICY SYSTEMS

## –Linkage and Article 6 of the Paris Agreement

# Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)

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## Key Points

- International linkage of regional, national, and subnational climate policies could play an important role in supporting the ramp up of ambition in Nationally Determined Contributions (NDCs) over time — including, over the longer term, in East Asia — and so contribute to the success of the Paris Agreement.
- Linkage has the potential to lower overall costs of mitigation, given the wide range of marginal abatement costs across countries, and also can lower administrative costs of compliance and help build political momentum, both of which can contribute to scaling up ambition.
- The bottom-up nature of the Paris Agreement has led to great heterogeneity of NDCs, which can pose challenges for linking. These challenges are not insurmountable, but will require thoughtful guidance for the effective operation of key provisions for linking in Article 6 of the Paris Agreement.
- Article 6 guidance can facilitate linkage by, among other things, providing clear definitions and principles for internationally transferred mitigation outcomes (ITMOs), taking into account the heterogeneous nature of NDCs, while avoiding restrictive criteria that could impede effective linkage.

## Introduction

The Paris Agreement features a hybrid policy architecture, combining top-down elements for monitoring, reporting, and verification, and bottom-up elements, including NDCs.[1] The Agreement has achieved a key necessary condition for ultimate success, namely adequate scope of participation, with participating nations accounting for virtually 100% of global GHG emissions.

1 The arguments in this brief are developed more fully in Mehling, *et al.* (2017). Citations to the relevant literature are provided there.

The other key necessary condition for ultimate success of this new approach is adequate, collective ambition of the individual NDCs — to put the world on a path toward achieving the global political target of limiting temperature increases to 2° C. A central question is how to provide a structure and/or incentives that will facilitate such increases in ambition over time. International linkage of regional, national, and sub-national policies can be part of the answer.

A challenge — including in East Asia — is the substantial degree of heterogeneity that characterizes climate policies along three dimensions: types of policy instruments, levels of political jurisdictions implementing those policies, and types of targets. Our research examines such heterogeneity and identifies: (a) which linkages are feasible; (b) of these, which are most promising; and (c) what accounting mechanisms would make their operation consistent with the Paris Agreement.

## Why focus on linkage?

The main economic argument for linkage is cost effectiveness — the ability to achieve a given level of emission reductions at lowest cost. Since a major impediment to ambitious climate policy is concern about the cost of mitigation, any policy that can lower costs can also lower political resistance to ambitious policy. It has been estimated that international linkage could reduce the cost of achieving the emissions reductions specified in the initial set of NDCs under the Paris Agreement by 32% by 2030 and by 54% by 2050 (World Bank 2016, 83, 86).

Linkage can be valuable even when the linking jurisdictions have similar carbon prices. Here, the benefits are political and administrative rather than economic. The political benefits from linking policies may stem from providing a sense of momentum to which political supporters of climate policy can point and so build support. Since GHG emissions are a global pollutant, no politician wants to appear to be acting unilaterally to control emissions. Linking with other jurisdictions is a tangible signal of a multilateral approach to the problem. There are also administrative economies of scale through linkage. Jurisdictions can share best practices in designing and operating emission-control policies and so learn from each other. They can also share administrative and oversight costs and avoid costly duplication of control efforts.

## Linkage and heterogeneous systems

The bottom-up nature of the Paris Agreement has led to great heterogeneity in the submitted NDCs. We separate these heterogeneous attributes into three categories: policy instrument, political jurisdiction, and target. We divide our consideration of political jurisdiction into two types of heterogeneity: level of government engaged in the prospective linkage (regional, national, or sub-national) and status under the Paris Agreement (Party or non-Party). Finally we focus on two types of target heterogeneity: the type of policy-instrument target and the type of NDC target. Our research suggests that heterogeneity *per se* is not an impediment to

linkage. But there is a role for guidance on the key provision in the Paris Agreement for linking — Article 6.2.

## Priorities for effective Article 6 guidance

Parties are currently working to elaborate guidance on Article 6.2, but have expressed widely differing views on what issues to include in such guidance. During the discussions at COP-23 in Bonn, Parties signaled agreement on the need to offer at least minimal guidance on how to account for transfers of ITMOs, yet diverged on a number of specific issues.

Elements that will most surely see inclusion in guidance on Article 6.2 are definitions, principles, and accounting rules to prevent double-counting of emission reductions. Beyond that, Parties are likely to adopt some clarification on how to quantify mitigation targets and outcomes from different types of climate actions (whether through carbon taxes, cap-and-trade instruments, performance standards, or other policy instruments); and how to accommodate heterogeneity of target types, differing base years among linking parties, and differences in degree of geographic coverage of NDCs.

Guidance on Article 6.2 could also address the nature and scope of ITMOs. One issue is the metric for ITMOs: Will there be a single common metric, presumably tons of $CO_2$ equivalent, or will there be multiple metrics, such as installed capacity of renewable power? This relates to a broader question of whether ITMOs will be, in effect, a single or multiple type of compliance unit.

Some parties support addressing additional topics in the guidance, such as environmental integrity and sustainable development; institutional elements, such as centralized registry tracking of the transfer and use of ITMOs; and eligibility and accounting of transfers to or from non-Parties (or sub-national jurisdictions therein). Importantly, however, it is far from certain that inclusion of these issues will garner the necessary consensus among Parties nor is it clear that some of the topics under discussion would contribute to cost-effective emission mitigation.

As they negotiate the work program on implementation of the Paris Agreement, Parties have an opportunity to establish clear and consistent guidance for operationalizing Article 6. If they can set aside political differences and agree on a robust framework for ITMO transfers, they will not only avoid impeding future linkage of climate policies across jurisdictions, but could create an enabling context with common definitions and modalities. Such a harmonized set of parameters could help accelerate linkage and allow for broader and deeper cooperation.

It could also enhance Parties' — including those in East Asia — ability to scale up the ambition of their NDCs and potentially foster constructive engagement between Parties and non-Parties, as well as sub-national jurisdictions. But if guidance extends much beyond basic accounting rules, restrictive requirements could impede effective linkage. True to the spirit of the Paris Agreement, less can be more. A combination of common accounting rules and absence of restrictive criteria and conditions might therefore be the best outcome for broader and deeper climate policy cooperation.

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# Asia-Pacific Carbon Market linkage under the Paris Agreement: Modality and Key Issues

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## Key Points

- Linking Asia-Pacific carbon markets is important to cost-effectively reduce regional greenhouse gas (GHG) emissions and advance global efforts to achieve long-term targets for climate-change mitigation. The Paris Agreement builds an international political foundation for linking carbon markets.
- Domestic carbon markets are emerging in the Asia-Pacific region. These markets are in different modalities and stages of operation. Carbon-market cooperation has been ongoing at technical level.
- The modality and level of initial carbon-market linkage needs to reflect the existing state of domestic carbon-market development in participating countries.
- Carbon-market linkage among Asia-Pacific countries should be established consistent with the requirements of the Paris Agreement. Harmonization of technical standards, capacity building, and political support are required to build up regional linkage.

## Introduction

Carbon trading and other forms of carbon pricing are being introduced around the world. Linking carbon-pricing policies across borders could lower mitigation costs, enhance policy effectiveness, and provide opportunities to undertake more ambitious actions aimed at limiting global warming to 2° C, with a view to limiting warming to 1.5° C, if possible.

Under the Paris Agreement, countries establish mutually recognized national mitigation targets through Nationally Determined Contributions (NDCs) for specified periods beyond 2020. These NDCs provide an important and solid foundation for setting the stringency of emission caps in national carbon-trading systems.

Article 6 of the Paris Agreement allows countries to achieve their NDCs and enhance their mitigation ambition through cooperative approaches (including emissions trading and credit

trading) on a voluntary basis. In this way, Article 6 provides a political foundation for linking carbon markets and creates opportunities for carbon trading across countries.

About half the countries in the Asia-Pacific region have expressed their intention to use market-based mechanisms in the implementation of their NDCs. A growing number of countries are implementing or planning to implement carbon trading in the form of either emissions-trading or credit-trading systems.

Energy-related $CO_2$ emissions from Asian countries are projected to account for approximately 50% of global $CO_2$ emissions in 2035 (ADB 2013). Cooperation among countries in this region is particularly important to reduce carbon emissions cost-effectively and to advance countries' mitigation ambitions.

## Modality of carbon markets and cooperation in Asia and the Pacific

### *Modality of domestic carbon-trading schemes*

In Asia and the Pacific, nine countries are implementing or are planning to implement carbon-trading schemes. These schemes are in different modalities and at different stages of development.

New Zealand, Kazakhstan, the Republic of Korea (Korea), and China have established or are scheduled to establish national emissions-trading schemes (ETSs). Other countries, including Indonesia, Thailand, Vietnam, and Sri Lanka (World Bank PMR 2016) have opted to develop domestic voluntary crediting schemes as a first step toward accumulating experience; they may consider piloting ETSs in certain sectors or sub-national regions beyond 2020. Japan does not intend to establish a national emissions-trading market, even though it has two city-based trading systems (the Tokyo ETS and the Saitama ETS), but Japan does plan to offset its emissions through a crediting scheme in cooperation with other countries.

New Zealand, Kazakhstan, and Korea have ETSs in place already; their ETSs have been adjusted and improved since commencing operation. Kazakhstan has now suspended its ETS until January 2018 while it updates the operation system (IETA 2016). Korea's ETS (K-ETS) is being amended.

It should be noted that the ongoing carbon-trading instruments being applied by countries today were mainly introduced to achieve national low-carbon development goals before 2020. This will help countries gain practical experience that can be applied to improving carbon-trading policies and instruments and achieving NDC goals by 2030.

### *Current carbon-market cooperation and future linking considerations*

Countries that have carbon-trading schemes in place or under consideration are generally open to linking with other markets, and a number of cooperative efforts have been initiated or are ongoing. For example, carbon-market linkage is a key element of China's national ETS development (World Bank PMR 2013). China is pushing forward to enhance international cooperation on green finance, including carbon markets (People's Bank of China 2016). The Belt and Road Initiative and South-South Cooperation have further enhanced political momentum to engage in international carbon-market cooperation.

Technical dialogue relevant to ETS cooperation has been initiated among Northeast Asian governments and experts from China, Korea, and Japan are now studying the potential for ETS linkage. Government officials and experts from these three countries have held a first meeting to share carbon-trading experiences and explore opportunities for further cooperation (Tsinghua University 2016).

K-ETS regulations allow for linking with other ETSs that are comparable and credible. Korea has a strong interest in building an integrated East Asian carbon market by linking its ETS with the ETSs of China and Japan. The amended K-ETS allows for the use of international credits in Phase II (2018-2021), which will speed linkages with other crediting schemes.

Japan's Joint Credit Mechanism (JCM) is the main instrument for carbon market cooperation between Japan and other countries. The JCM is being bilaterally implemented with 16 other countries.

New Zealand has a strong interest in developing a linked carbon market in the Asia and Pacific region. New Zealand signed a bilateral climate-change-action plan with China to cooperate on carbon markets (Government of New Zealand 2017a), and has discussed carbon market linkage with Korea (Government of New Zealand 2017b). Kazakhstan has expressed strong interest in linking to the ETSs of other countries in the future, as has Vietnam.

It is clear that national governments in Asia and the Pacific are positively inclined toward linking their carbon markets with other carbon markets in the long term, which sends a clear political signal that establishing a linked carbon market across countries in the region is possible in the future.

## Modality of carbon-market linkage and key issues

### *Initial modality of carbon-market linkage*

Carbon markets can be linked unilaterally, bilaterally, or multilaterally. A unilateral link between trading systems can be established by simply including a provision for the recognition

of foreign allowances or carbon credits in the emissions-trading legislation of the receiving country. Full bilateral or multilateral linkages require harmonizing key design features of the markets to be linked (ADB 2016). This usually involves a lengthy negotiation process and domestic ETS adjustments.

In deciding the modality and level of carbon-market linkage, governments need to consider factors such as level of development, maturity of domestic carbon markets, and political priority accorded to climate-change mitigation. Linking carbon markets should be envisaged as a progressive development process, along with domestic carbon-market development.

At an early stage, unilateral linkage could be a realistic option. Specifically, **linking one national ETS with a crediting scheme in another country could be the first step toward carbon market linkage.** This approach is suitable where one country does not have an ETS in place. For example, China's national ETS could be linked with crediting schemes in Indonesia, Sri Lanka, Thailand, and Vietnam, thereby allowing participants in China's ETS to offset their emissions by using credits from these countries.

Similar approaches can be used in the early stages of linking two national ETSs, with bilateral linkages to be developed gradually later on. For example, since the amended K-ETS allows ETS participants to use international credits to offset their emissions from 2018, K-ETS participants could be allowed to use credits from China's ETS to offset their emissions. Once both countries' ETSs are mature, this unilateral link could be upgraded to full bilateral linkage.

## *Key issues for consideration*

To link carbon markets across countries, policy makers will need to address several key issues at an early stage.

### Domestic support for achieving NDCs under the Paris Agreement

While domestic carbon markets have been developed or considered mainly for purposes of meeting domestic mitigation goals or promoting domestic low-carbon development, governments interested in pursuing linkage will need to consider the level of support in potential partner countries for achieving NDC targets under the Paris Agreement and for reaching other sustainable development goals. This will require more coordination on carbon-trading policy and NDCs among the linking partners.

Participating countries will also need to quantify and periodically review emission budgets under the NDCs of linked countries. Carbon-market linkage may lead to higher GHG emissions in one country and lower emissions in the other country, relative to what their emissions would be without linkage. But systems for trading credits should ensure that countries meet their own NDC targets. Most countries set carbon-intensity targets or business-as-usual

(BAU) targets as their NDCs, and those carbon intensity targets or BAU targets must be translated into quantified emission budgets that should be reviewed over time to ensure total emissions budgets are consistent with carbon-intensity targets.

**Harmonize eligibility, methodology, and procedure for certifying emission reduction**

Countries have developed different criteria, methodologies, and procedures to certify credits, and those diversified criteria and methodologies could raise major concerns about double counting and undermining environmental integrity. Countries wishing to link carbon markets should build common views and understanding on guidelines, criteria, and methodologies for assessing project additionality, baselines, accounting for emission reductions, and MRV, consistent with the relevant guidelines and principles established under the Paris Agreement. In addition, more clarity regarding internationally transferred mitigation outcomes (ITMOs) is needed to define eligibility and criteria for generation, transfer, use of ITMOs, and limits on use of ITMOs.

**Build readiness for carbon market linkage**

Domestic carbon markets are still at early stages of development in most countries and will be improved over time. Carbon-market linkage may only be considered when a domestic market is functioning well. For the time being, it is important for countries to build readiness for future carbon-market linkage, including a legal framework to establish domestic markets and international linkage, and a functioning system of carbon-market operation (including, for example, robust MRV mechanisms and oversight of trading).

**Requirement for political support**

Political support is critical for successfully implementing carbon-market linkage. Most importantly, countries must demonstrate political willingness to link their carbon markets, so as to facilitate political dialogue among countries interested in linkage. Such dialogue would enable countries to reach common understanding on technical standards, methodologies, and guidelines. Article 6 of the Paris Agreement provides a basis for such common understanding, but much work remains to be done among Asia-Pacific countries.

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# Linking NDCs through Article 6 of the Paris Agreement

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## Key Points

- The bottom-up approach of the Paris Agreement has proved a success in terms of participation, but also faces challenges with respect to ambition and cost effectiveness.
- Market mechanisms in Article 6 can help to improve the cost effectiveness of the Paris Agreement, but political barriers need to carefully addressed, especially as they relate to the comparability of NDCs and interaction with "nationally determined" characteristics.
- The Facilitative Dialogue in 2018 can be an opportunity to provide political momentum for negotiations on market mechanisms and allow more progress in negotiations at the technical level.

## Fragmented contributions in the world of the Paris Agreement

The architecture of the Paris Agreement is deeply rooted in the idea of incentivizing broader participation through bottom-up contributions — including, at present, submissions of Nationally Determined Contributions (NDCs) from more than 160 parties. There is no doubt that the Paris Agreement has succeeded in broadening participation; however the environmental effectiveness and cost effectiveness of the Paris framework is still in question. Its deference to the concept of national determination has made it easier for parties to design, communicate, and implement their climate pledges in a more comfortable manner than before. However, at the same time, the NDCs also represent an approach to global mitigation that is fragmented, with less coordination and collaboration.

The most well-known shortcoming of this approach is the lack of sufficient collective ambition and the inadequacy of pledged mitigation efforts, compared with the depth of the emissions cuts required to limit global average warming to the international target of 2° C. In aggregate, submitted NDCs are not ambitious enough to achieve a global emissions trajectory that is compatible with the 2° C target. In fact, based on submitted NDCs, an emissions gap of about 15 Gt will need to be resolved by 2030 and the gap may be greater after that. In addition to this "ambition gap," fragmented climate pledges also risk losing cost effectiveness by making it more difficult to achieve least-cost mitigation through international emissions trading or credit transfers. The lack of an international market mechanism may greatly increase the overall compliance cost of the Paris Agreement and lead to a "cost-effectiveness gap."

The Paris Agreement recognizes these two gaps and provides some possible solutions. Article 14, on the global stocktake, aims to close the "ambition gap" through a ratchet-up mechanism. Article 6 opens a window for voluntary cooperation among parties to and improve the cost effectiveness of mitigation through "a mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development" (Article 6.4). The rules, modalities, and procedures of the Article 6.4 mechanism are still being negotiated, but the importance of this mechanism should not be underestimated. Especially for the Asia region, which has the potential to be a major source of emissions reductions, the Article 6.4 mechanism could provide a unique opportunity to incentivize more ambitious pledges, improve cost effectiveness of mitigation actions, and even foster greater integration of economic development across the region. However, to achieve these potential benefits, some key challenges will need to be carefully addressed.

## The challenge of linking NDCs

The origins of the Paris Agreement's Article 6.4 can be traced back to the flexible mechanisms introduced under the Kyoto Protocol, especially emissions trading in Article 17 and Joint Implementation in Article 6. In contrast to the flexible mechanisms in the Kyoto Protocol, however, Article 6 will be operated within the context of NDCs, which are far more complicated than commitments under the Kyoto Protocol and which also generate various challenges for linking NDCs through this mechanism.

The first challenge is the bilateral political recognition of NDCs. One precondition for linkage is that both parties need to accept that their NDCs are sufficiently "comparable" that linking them will not trigger competitiveness concerns or massive transfers of money from one country to another. This comparability precondition, however, does not exist within the framework of the Paris Agreement, where the decision to adopt a bottom-up approach precluded debates over, and mutual understandings about, the comparability of efforts among Parties. This lack of confidence about comparability may complicate possible linkages among NDCs through the Article 6 mechanism.

Parties will need to address this issue through bilateral arrangements, but procedures to reach such arrangements could be inefficient and cause further, mutual delays. For example, the US decision to withdraw from the Paris Agreement has been justified by the argument that China and India are not making comparable efforts — an argument that will make it politically more difficult for other countries to recognize and link with the NDCs of China and India. This challenge is even more serious in the Asia region, where Japan has been considered as the largest potential buyer of mitigation credits from other countries under a trading mechanism.

A second challenge is the scope and definition of NDCs. The aim of the Article 6 mechanism is to achieve an overall global reduction and avoid double counting. Thus, emissions

reductions counted under this mechanism can only be used by one Party toward demonstrating achievement of its NDC. This exclusiveness requires consistency between the NDCs of Parties that use the Article 6 mechanism. Specifically, participants need to agree on which country is eligible to use a specified emission reduction in their NDC, but this conflicts with the concept of "nationally determined." For example, consider a case where country A defines its NDC based on domestic emissions, and then country A prepares to engage with country B in transferring emission reductions under Article 6. If country B asks to apply the same emission reduction to demonstrate progress toward its own NDC — and if country A agrees — then country A would need to redefine its NDC. This situation could trigger a national-level debate, because most NDCs are authorized by the country's legislative body, making them difficult to redefine or change.

Others challenges relate to accounting rules for NDCs, especially for assessing emission credits or transfers in the case of land use, land-use change, and forestry activities. For these types of carbon sink projects, a transaction log and an expert review process under transparency arrangements may be important. In addition, crediting mechanisms need to carefully capture the diversified form of NDCs, including especially differences between emissions-based NDCs and non-emissions-based NDCs (which may set targets in terms of projects and programs, or policies and measures). Such technical challenges are important for implementing the Article 6 mechanism in the real world, but they may be less difficult than the more overarching, political challenges noted above, which will determine countries' willingness to link their NDCs.

## The way forward

Gaps in both ambition and cost effectiveness will need to be addressed to enhance the overall effectiveness of the Paris Agreement. Although more focus has been placed on the emissions gap and the global stock-take, we believe the Article 6 mechanism and its implications are equally important. The forthcoming facilitative dialogue in 2018 is an important window of opportunity to set a good start for both the global stocktake and the Article 6 mechanism. Political leaders should send a clear signal that they are willing to work together on market mechanisms, starting from some level of recognition of the NDCs currently on the table together, with a willingness to identify possible options for resolving the challenges discussed in the previous section. Political momentum will reduce the risk of deadlock and expand the space for negotiation on technical issues. For Asian countries, another possible foundation for cooperation may be found in Article 4.18, which allows parties in a regional economic integration organization to be responsible for their pledges as a group. However, this alternative requires a more ambitious effort to advance the integration of Asian economies, and such an effort has yet to emerge.

# NON-MARKET (AND MODIFIED-MARKET) APPROACHES TO INTERNATIONAL COOPERATION

# Developing Non-Market Approaches through Regional Cooperation Platforms

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## Key Points:

- Regional cooperation platforms in Asia can develop important non-market approaches to help Asian countries achieve their Nationally Determined Contributions (NDCs).
- With increasing trade intensities among Asian countries, the ambition of regional mitigation and adaptation policy can be enhanced by linking climate policies to regional trade and investment.
- China's Belt and Road (B&R) Initiative needs to include mechanisms to prevent participating countries from being locked into carbon-intensive infrastructure and manufacturing.

Articles 6.8 and 6.9 of the Paris Agreement call for using non-market approaches to assist Parties in achieving their NDCs. International and regional cooperation platforms can potentially develop non-market approaches to facilitate green finance, technology transfer, and capacity building that promote low-carbon development. Integrating climate cooperation into existing and new regional cooperation platforms may incentivize Parties to enhance their ambition with respect to mitigation and adaptation. In addition to climate benefits, regional cooperation platforms may also support inclusive economic and social development goals such as poverty reduction, stronger public and private participation, and more environmentally-friendly institutions.

## Regional Cooperation Platforms in Asia

Regional cooperation platforms in Asia at the bilateral or multilateral level are becoming an important resource for combating climate change. These platforms can be classified into three categories: regional organizations, multilateral regional initiatives, and transnational organizations. Regional organizations — such as the Association of Southeast Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) — have long track records of promoting green development, trade, and investment. Multilateral regional initiatives — including the East Asia Low Carbon Growth Partnership (EALCGP) and Emerging Asia Capital Partners (EACP) — usually have a broader reach in participating countries and thus have extensive

regional impacts. Low-carbon transnational organizations — such as the Renewable Energy and Energy Efficiency Partnership (REEEP) and the Collaborative Labeling and Appliance Standard Program (CLASP) — are focused on specific areas. All these cooperation platforms can assist Asian countries in achieving their NDCs through various types of cooperation in the public and private sectors.

Existing cooperation platforms contribute to mitigation and adaption mainly through low-carbon policy alignment, financial and technical support for green projects, and capacity building. The cooperation platforms in Asia with a sustainability mission can create abundant opportunities in low-carbon development from the perspective of policy, technology, finance, investment, and trade. These cooperative mitigation and adaptation activities involve different stakeholders, including governments, enterprises, academic institutions, and NGOs.

Specifically, these platforms can be used to set regional targets and develop action plans for harmonizing government policies with respect to environmental and development goals. They offer various sources of financial support for green projects and advance local green technologies by means of R&D, technology transfer, and capacity building for local government officials. Furthermore, these platforms provide incentives for green investment in the private sector and boost demand for green technologies and products.

## China's Belt and Road Initiative

China's B&R Initiative[1] may have a profound impact on regional climate actions. It is an ambitious regional cooperation initiative that promotes trade, investment, and economic development across 68 Eurasian countries. As China's top-level international policy initiative, B&R was proposed by Chinese President Xi Jinping in 2013 out of geopolitical and economic interests. Although it is mainly intended to foster regional economic cooperation, its focus on energy and infrastructure will influence mitigation and adaptation activities in the countries involved.

First, the economies of the B&R countries tend to be carbon intensive. Per capita carbon dioxide ($CO_2$) emissions in the B&R countries (at 6.13 tons per year) are significantly higher than global average per capita emissions (at 4.17 tons per year). The economies of the B&R countries are also more carbon-intensive, producing 0.7 kg of $CO_2$ emissions per U.S. dollar of GDP, compared to a global average level of 0.44 kg $CO_2$ per dollar of GDP. Without appropriate regulations, accelerating infrastructure development in the B&R countries will further increase carbon emissions.

Second, China may relocate its excess industrial capacity to the B&R countries. China currently has excess production capacity in several carbon-intensive industries, such as rolled

1 "Belt & Road" is short for "The Silk Road Economic Belt and the 21st-Century Maritime Silk Road."

steel, electrolytic aluminum, cement, plant glass, crude steel, and thermal power. Moreover, its capacities in rolled steel, electrolytic aluminum, and thermal power are still growing, exacerbating the overcapacity concern. Since one objective of the B&R Initiative is to increase international demand for Chinese products from these carbon-intensive industries, there is concern that the Initiative could have unintended consequences in terms of increasing carbon emissions.

Realizing the potential environmental and climate risks, China has been increasingly stressing the importance of green B&R. On the one hand, as the largest GHG emitter in the world, China has promised to ensure that its carbon emissions will peak around 2030, as part of its NDC under the Paris Agreement. Incorporating carbon emission standards into the B&R Initiative will reduce leakage and help China establish global climate leadership.

On the other hand, China aims to resolve the issue of excess capacity by optimizing its industrial structure — for example, shutting down backward production facilities and subsidizing green industries. As China is gradually gaining competitive advantage in green technologies and products, the B&R Initiative has the potential to become an important platform for promoting low-carbon development and increasing climate-mitigation ambition by decarbonizing China's outbound trade and investment.

## Conclusion

There are many challenges to using regional collaboration platforms and the emerging B&R Initiative to advance non-market approaches that can help Asian countries achieve their NDCs. First, because most existing regional cooperation platforms are mainly focused on governments and academic institutions, it will be important to facilitate the participation of energy and infrastructure enterprises, in both the public and private sectors. Second, the effectiveness of climate cooperation projects under existing regional platforms might be limited, because most activities are voluntary. Cooperation aimed at aligning policies and coordinating regulations among the Asian countries may be more effective. Finally, trade intensity between China and the other B&R countries is steadily increasing. A green trade and investment assessment system needs to be designed to enhance and ensure a green B&R.

# Status and Prospects for Article 6 of the Paris Agreement: Implications for Cooperation in East Asia

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## Key Points

- Article 6 of the Paris Agreement provides incentives for cooperation among nations in implementing their Nationally Determined Contributions (NDCs).
- Although several East Asian countries, including the major emitting nations of China, Japan, and South Korea, have piloted or are implementing emissions-trading schemes (ETSs), a fully linked East Asian (or Northeast Asian) carbon market is probably not feasible in the near term.
- Rather, East Asian countries could use incentive mechanisms under Article 6 to promote regional cooperation on issues such as renewable energy, deforestation, and other low-carbon development opportunities — possibly by forming a regional climate club.
- Such cooperation has the potential to generate significant volumes of internationally transferred mitigation outcomes (ITMOs) that can be used to help East Asian countries achieve their NDCs, while also laying the groundwork for further regional cooperation and eventual carbon market linkage.

## Article 6 of the Paris Agreement

Article 6 of the Paris Agreement introduces an innovative mechanism to promote effective implementation of countries' NDCs. Specifically, Article 6 creates incentives for countries to effectively implement their NDCs by transferring greenhouse-gas- (GHG) mitigation outcomes to other countries.

Article 6.1 addresses general issues, such as the importance of voluntary cooperation on NDC implementation, environmental integrity, and sustainable development. Article 6.2 provides opportunities for international cooperation through the transfer of mitigation outcomes (ITMOs) in the form of quantifiable units. ITMOs could be transferred in a number of ways:

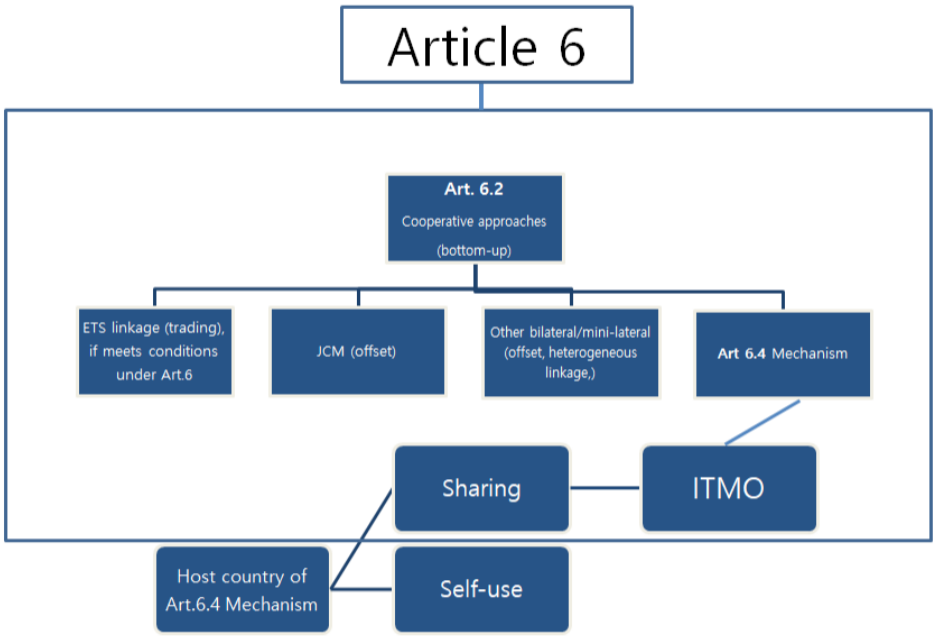
- Through linkage between existing ETSs.
- Through bilateral or multilateral cooperation that is initiated and executed through bottom-up mechanisms, such as Japan's Joint Crediting Mechanism (JCM) or similar mechanisms to be created under Article 6.2.

- Through multilateral mechanisms to be created and managed by international organizations, such as the Carbon and Finance Club of the Global Green Growth Institute (GGGI) and similar mechanisms developed by the Asian Development Bank (ADB) and the World Bank.
- Through heterogeneous linkage — that is, linkage between policies that are different from one another and that may not include ETSs.

Although cooperative approaches under Article 6.2 will provide countries with flexibility in implementing their NDCs, they must meet minimum standards, including adhering to accounting rules to be developed by Parties and included in the Paris Rule Book. Importantly, the ultimate beneficiaries of Article 6.2 must be sovereign countries that are Parties to the Paris Agreement, because Article 6 envisions that ITMOs must be used to implement the NDCs of member countries.

Article 6.4, on the other hand, deals with centrally managed mechanisms for generating credits. The UNFCCC will likely play a role in managing the Article 6.4 Mechanism, as it does in the case of the Kyoto Protocol's Clean Development Mechanism (CDM). As all Parties to the Paris Agreement have their own emission-reduction targets (unlike under Kyoto Protocol), host countries under the Article 6.4 mechanism may need to use 6.4 credits to implement their own NDCs (unlike with the CDM). In this case, only some part of 6.4 credits that will be used for the implementation of other countries' NDCs may become ITMOs governed by Article 6.2. A major challenge in developing Article 6 modalities, procedures, and guidelines will be to strike a reasonable balance in flows of 6.4 credits.

## Article 6 of the Paris Agreement



## Potential for creating a carbon market in Northeast Asia

Northeast Asia, which includes three major-emitting nations — China, Japan and South Korea — has the potential to develop carbon-market cooperation under Article 6. Article 6 envisions various mechanisms for sharing emission outcomes that could help Northeast Asian countries implement their respective NDCs. Renewable energy is one of the key areas where close cooperation may be required for each country to meet its GHG emission targets. China, Japan, and South Korea together accounted for about 56% of global coal consumption in 2016. In the case of oil, these three countries account for 26% of total world consumption. Considering the huge renewable energy potential of Mongolia's Gobi desert, China, Japan, and South Korea — along with Mongolia — can make a strong case for cooperation to develop renewable resources and thereby produce a large quantity of ITMOs.

Furthermore, Northeast Asia has consistently faced critical challenges on issues related to forestry. Significant desertification in areas of China and Mongolia has caused serious yellow-sand-dust problems that have threatened human health and industrial activities throughout the region. Soot from large-scale forest fires in Siberia threaten the climate system in Northeast Asia. In North Korea, lack of food and energy has created deforestation problems. Consequently, North Korea's per capita GHG emissions are higher than those of similar developing economies. Addressing various forestry-related problems in Northeast Asia will require region-wide cooperation in energy, food, and forestry management that will also be able to generate ITMOs.

## What needs to be done to establish a Northeast Asian carbon market?

In the context of Article 6, several types of carbon markets can be considered in Northeast Asia. One possible approach to establishing a regional carbon market — linking ETSs among China, Japan, and Korea — seems to be infeasible in the short run.

China is about to introduce a nationwide ETS after operating several pilot ETSs for the last several years. Based on its significant experience with hosting CDM projects, China will strengthen its national systems for a while before turning attention to linking its ETS with other countries' trading systems. Another challenge for China may be ensuring the technical compatibility of its ETS with other ETSs, such as the Korean ETS (K-ETS). However, it is still unclear to what extent China will find it helpful to cooperate with regional partners in other areas of climate change mitigation, such as renewable-energy infrastructure and forestry.

Japan has thus far placed more emphasis on offset markets than on an ETS. Before the Paris Agreement, Japan gained experience with utilizing domestic offsets to encourage technology development. At the international level, Japan has introduced its own international offset mechanism — the JCM. In terms of emissions trading, Japan currently has only city-level ETSs for Tokyo and neighboring Saitama. In the near future, Japan seems unlikely to actively

consider introducing a national ETS or linking with other ETSs in Northeast Asia to implement its NDC.

South Korea may have the most advanced national-level ETS among Northeast Asian countries. In the past, its ETS focused more on compliance than on trading, while covering approximately 80% of national emissions. However, in its NDC, South Korea emphasized plans to utilize international market mechanisms — in other words, Article 6 measures. According to domestic communications, South Korea also announced that it would use international market mechanisms to achieve 11.3% of its NDC target, which is a 37% economy-wide emissions reduction from business as usual by 2030. As this portion of the reduction may not be achievable through its domestic ETS, South Korea must secure a large quantity of ITMOs to meet its target, unless it strengthens the GHG-emission-reduction target of its domestic system.

As linking ETSs among Northeast Asian countries may not occur in the near future, efforts to develop a Northeast Asian carbon market may need to reflect more realistic and politically feasible considerations. In other words, under Article 6 of the Paris Agreement, which allows cooperation among countries to implement their NDCs, Northeast Asian countries could work together to promote mega-regional projects in areas such as renewable energy and forestry as a way to realize GHG reductions that can be counted toward achieving their individual NDCs.

Thus, it may be desirable for Northeast Asian countries, including China, Japan, South Korea, Russia, Mongolia, and North Korea, to establish a regional carbon club under Article 6, with which they can develop flexible cooperative mechanisms, with the help of other stakeholders, such as GGGI, ADB, the World Bank, and the Global Carbon Fund. Ultimately, such cooperative mechanisms could generate a large quantity of ITMOs by promoting region-wide low-carbon development activities, while also advancing efforts to create an effective carbon market at the regional level.

# Climate Teams: A New Model for Investor-Host Climate Cooperation

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## Key Points

- Some countries are willing to transfer significant resources to increase the speed of others' transition to zero net carbon emissions. No effective, credible international mechanism that can be applied to emission reductions in all sectors currently exists to do this, but the cooperative approaches of Article 6.2 of the Paris Agreement provide space for innovation.
- A "climate team" offers one model to enable host (low marginal cost) and investor (high marginal cost) countries to cooperate to genuinely reduce global emissions and enable more ambitious Nationally Determined Contributions (NDCs) in both.
- A large (national- or jurisdictional-) scale climate team agreement can more easily demonstrate additionality of mitigation and avoid leakage. Such an agreement can take advantage of existing commitments (NDCs as a basis for crediting baselines) and monitoring (national inventories), thereby increasing transparency and reducing administrative costs.
- Transformational change requires significant policy changes and large investments, which can be both economically and politically costly. The climate team model gives the host country confidence that it will receive an acceptable return if it successfully reduces emissions.

1 The authors collaborated with Seong-il Kim and Dong-hwan Kim (Seoul National University); Angela Cadena, Mario Andres Londoño, and Diana Paola Calpa Reina (Universidad de los Andes, Colombia); Alex Hanafi (Environmental Defense Fund); and Edmund Lou (Motu). This research has been funded by the Aotearoa Foundation, Te Punaha Matatini Centre for Research Excellence, and the Korean Forest Service. All opinions expressed and any errors are the responsibility of the authors.

## The challenge the "climate team" model addresses

Under the Paris Agreement, each country chooses the contribution to global climate stabilization that it is able and willing to achieve. This is their NDC. Because opportunities to mitigate greenhouse-gas emissions and the resources to do so vary greatly across countries, the marginal cost of achieving these domestically set goals varies greatly. If resources — and mitigation outcomes — can be transferred across countries, these resource flows can enable credible additional mitigation beyond NDCs in countries with low marginal mitigation costs. Lower overall mitigation costs, in turn, can enable countries to accept more ambitious NDCs in the future, ultimately leading to more global mitigation. No transfer mechanism has been specifically elaborated under the Paris Agreement, but Article 6 offers the opportunity for innovation to address this critical challenge.

Traditional models for resource transfer — project-based offset programs such as the Clean Development Mechanism or linkage of emissions trading systems — have limitations. Project-based offset programs have high transaction costs and, despite strong efforts to improve processes, are inherently unable to achieve high levels of additionality (Kerr and Millard-Ball 2012). It is also unclear how project-based offsets can operate in the context of sector-based or economy-wide NDCs and the need to avoid double counting of reductions towards international commitments.

Linking emissions trading systems will be effective in some circumstances. However, linking requires the willingness and ability to create a strong emissions-trading system within each jurisdiction. Also, when the climate politics of one country are highly unstable, a linked emissions-trading system can lead to unstable price signals for investment in the other country (as in a currency union when monetary or fiscal policy is unstable in one country). The smaller trading partner will largely lose control over its emissions price and lose much of its climate-policy sovereignty (Ormsby and Kerr 2016). Existing linkages have generally involved very similar jurisdictions that are already closely connected economically and culturally (Partnership for Market Readiness and International Carbon Action Partnership 2016).

## What is a climate team?

A climate team takes a fundamentally different approach relative to traditional mechanisms. It is an agreement among governments that comprises:

1. An emissions baseline that uses the host's NDC as a starting point for negotiation;
2. Pre-commitment of total investor funds available for payments;[2]

2 An "investor" is a party who wants to receive transferrable emission reductions. An investor-country government may choose to allow private investors to participate as investors in the agreement.

3. A pre-agreed price range for payments per ton of reduction;
4. Assessment of results relative to the baseline using the host's national emissions inventory;
5. Results-based payments from the investor to the host.

The climate team model has five key benefits.

***Credible baselines for large-scale transfers:*** "Investor" countries need large amounts of internationally transferred mitigation outcomes (ITMOs) that credibly go beyond the host's NDC. A stringent climate team baseline in the early years allows transfers before 2030 if the host country is credibly on-track to exceed their NDC. Transparent setting of these baselines, with oversight by a wider set of countries, will increase confidence in the integrity of the climate team agreement and give the investor country confidence that its contribution will be recognized for achievement of its own NDC. Using large-scale, possibly even economy-wide, baselines that reduce problems of assessing additionality (van Benthem and Kerr 2013) and avoid within-country leakage, also increases the credibility of the transferred units. The Warsaw Framework for Reducing Emissions from Deforestation and Forest Degradation (REDD+)[3] provides a precedent for this approach, through the idea of "jurisdictional offsets."[4]

***Robust monitoring:*** The climate team model uses existing large-scale monitoring systems (national emissions inventories), which already reflect international best practice, along with auditing processes, to minimize bias and provide consistency over time at a national level.

***Guarantee of resource flow to host country if it achieves large reductions:*** The clear pre-commitment of funds to pay for future transfers and agreement as to the minimum transfer price give the host country greater confidence when making transformational policy changes and supporting public and private investments in mitigation actions.

***Security of supply of ITMOs to investors:*** The investor pays for the transfer of mitigation outcomes only after the mitigation has been proven to have occurred. The host country commits to give priority to climate team members when transferring mitigation outcomes until the investor's pre-committed funds are exhausted. Together with the maximum agreed price, this provides greater security of supply to investors. If reductions are made, the investor has the right to claim them at a reasonable price.

***Reduced risk of ineffective mitigation effort:*** There is still a very real risk that mitigation effort in the host country, however genuine, will produce only small reductions, particularly

3 http://unfccc.int/land_use_and_climate_change/redd/items/8180.php

4 The climate team model builds closely on the Amazon Fund that aims to reduce deforestation in Brazil. See: http://www.amazonfund.gov.br/FundoAmazonia/fam/site_en.

in the short term. The climate team model helps address this risk, in part, by aligning the incentives of investors and hosts to work together toward successful low-emission transformation in the host country. Climate finance (with no expectation of ITMOs) can be used strategically to help the host country reach the crediting baseline. The climate team agreement provides a strong basis for providing expertise, strategic public and private investments, and a shift in the political climate and society-wide narrative toward an inevitable transition to low emissions. It facilitates politically challenging regulatory changes. Investors and hosts can choose to combine in teams that they believe will be effective. Countries may share policy experience, technology, and skills. Investors can also choose to invest in a portfolio of climate team (and other) agreements to reduce the risk that they will not receive sufficient ITMOs to achieve their own NDCs.

This approach will not work for all countries, but could work for a significant subset. The climate team model depends first on a clearly defined NDC in the host country. This NDC needs to have broad sectoral coverage and a level of mitigation ambition that is acceptably high to both investors and the wider international community. It depends also on an adequate national inventory in the host country; this can be improved through the climate team agreement. The level of funding committed by investors as a group needs to be high enough to enable transformational change, and the host country must, with help, have the capability to achieve this change.

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# Air Quality Co-benefits and the Design of $CO_2$ Emissions Pricing in East Asia

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## Key Points

- Policies targeting reductions in air pollutants and carbon dioxide ($CO_2$), a major greenhouse gas, interact because both affect fossil fuel use in energy-intensive industries, including electric power and heat, iron and steel, and cement production.
- By transferring $CO_2$ emissions-reduction obligations from high- to low-abatement-cost emitters, $CO_2$ emissions pricing can change the spatial pattern of local air pollution emissions in ways that increase or decrease related health effects of short-lived localized air pollutants. In linked pricing systems, this spatial redistribution may occur across regional or national borders.
- There is large potential for climate policy in mainland China to achieve local air-quality co-benefits, given that most cost-effective $CO_2$ abatement opportunities, which involve reducing coal use near populous inland cities, would result in significant reductions in emissions of local air pollutants — sulfur dioxide ($SO_2$) and nitrogen oxides ($NO_X$).
- As developed Asian economies consider linking their $CO_2$ emissions-pricing systems to China's national system, estimates of domestic air-quality co-benefits — due to reduced emissions from both local and cross-border sources — should be assessed and included in comparisons of policy options.
- Reliable and transparent data collected by continuous emissions-monitoring systems for both $CO_2$ and localized air pollutants will be important to assess performance and update policy over time.

$SO_2$ and $NO_X$ are typically co-emitted with $CO_2$ in energy-intensive industrial processes that rely on fossil fuels. These air pollutants are important contributors to the formation of fine particulate matter (PM2.5), which has acute and chronic adverse effects on human health. Therefore, climate policies that target $CO_2$ have the potential to reduce $NO_X$ and $SO_2$ emissions if they reduce fossil fuel use through efficiency or clean fuel substitution, particularly if displaced activities are not already subject to tough air pollution controls.

The potential to reduce local air pollution via $CO_2$ pricing could be particularly significant in China, because of its economic size and its coal-heavy energy mix. In China, fossil fuel combustion accounts for 80.9% of $CO_2$ emissions and 91.0% and 90.7% of $SO_2$ and $NO_X$ emissions, respectively. While the use of end-of-pipe pollution controls — which limit the potential for co-benefits — has increased in mainland China in recent decades, their use is still far from universal. Our research suggests that a $CO_2$ price that incentivizes deep reductions in coal use has the potential to improve local air quality, both in Chinese urban centers and in downwind locations elsewhere in Asia. In China, displacing coal use in these populous locations remains the most cost-effective source of $CO_2$ abatement as $CO_2$ prices increase.

In many markets in East Asia, opportunities for abating $CO_2$ are more limited, relative to China, for several reasons. First, in other markets, some options for abating $CO_2$ that do not simultaneously reduce local-air-pollutant emissions may account for a larger share of cost-effective abatement. (Examples of these options are end-of-pipe solutions like carbon capture and storage, or technologies for reducing process emissions from cement.) Second, air pollution controls and effective monitoring regimes have already been implemented, to a large degree, in developed countries. Third, there is uncertainty under $CO_2$ pricing about which installations will reduce $CO_2$ emissions, and which will purchase permits that allow them to continue emitting. Concern that firms located in populous or poor areas will disproportionately choose to purchase $CO_2$ permits rather than abate their emissions underlies the concern of environmental justice advocates that pricing schemes could create or perpetuate local pollution hotspots.

If $CO_2$ pricing systems in, for example, Japan or the Republic of Korea (Korea) link with China, we might expect an increase — or a more limited reduction — in local air pollution in these developed East Asian economies, to the extent that trading takes advantage of the large, relatively low-cost abatement potential currently estimated to exist in mainland China. In these developed East Asian countries with generally good air quality, small changes in emissions can yield increases in pollution concentrations and health impacts that are large in relative terms — and that are therefore cause for public concern.

Conversely, if $CO_2$ pricing substantially reduces both industrial $CO_2$ and local pollutant emissions in China, especially in the northeastern provinces close to Korea and Japan, potential air quality improvements could be relatively large due to pollutant emission reductions in upwind locations. Especially during the cold seasons, when China's coal-fired district-heating stations are online, moderate improvements in air quality could translate into meaningful health benefits. As noted, local co-benefits in Korea and Japan may be limited if air-pollution controls are already comprehensive; in addition, the effects of reductions in China may be attenuated by distance. Research is needed to understand the net effect under each linkage scenario.

International cooperation to monitor and publish estimates of the direct benefits and co-benefits of proposals for linked policies will be important. Simulated policy impacts depend strongly on assumptions about emissions baselines and implementation. These could be fruitful topics for regional collaboration to improve emissions inventories, conduct model simulations, and expand measurement. Monitoring actual impacts associated with linkage *ex post* will also be important. There is no guarantee that initial estimates of co-benefits will persist over time, as the geography of abatement opportunities changes due to advances in technology and associated cost reductions, changing tastes and preferences, and industry dynamics. Sufficiently stringent — but flexible and fully implemented — local pollution-control requirements will help to maximize the co-benefits of linked climate policies in a cost-effective manner.

The interaction between climate policy and air-quality policy within and across jurisdictions must also be considered. For countries committed to making reductions in $CO_2$ and other greenhouse gases, dedicated climate policy targets, measures, and associated implementation capacity will be paramount. While air-quality policies may deliver unintended reductions in $CO_2$, binding measures to reduce greenhouse gases are necessary to ensure that air pollution countermeasures are consistent with climate-change-mitigation objectives. Focusing on air quality alone could, for example, prompt heavy polluters to relocate away from population centers, with no impact on climate goals. Coordinating policies within and across administrative borders to encourage least-cost $CO_2$ and air-pollution mitigation will be important to realizing lasting progress on these interlinked environmental challenges in East Asia and elsewhere.

# Electrical Power Connectivity in East Asia

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## Key Points

- Electricity interconnection between countries across a region can bring several benefits. In the context of non-market mechanisms to reduce greenhouse gas emissions,[1] the most important of these benefits is the opportunity to transmit electricity from countries rich in renewable energy resources to those that are reliant on fossil fuels.
- To date, most transboundary electricity interconnections in East Asia have been constructed on the basis of bilateral arrangements to transmit electricity from specific power generation projects. Most of these interconnections lie in South East Asia. Interconnections in Northeast Asia are poorly developed by comparison.
- Multilateral trading offers the opportunity for more flexible trading between a larger number of actors and to reduce system costs. The potential for such multilateral trading is being actively explored in South East Asia, within both the Association of Southeast Asia Nations (ASEAN) and the Greater Mekong Subregion (GMS).

## Introduction

Connecting national electricity grids across a region can deliver a number of public and private benefits, as has long been recognized. Security of energy supply is one of the most important of these, as short- or long-term deficits in one country can be ameliorated with supply from another country on the same grid. Interconnection may also enhance electricity access in the deficit country. In the context of climate change, the most important contribution of regional connectivity is the ability to transmit low-carbon electricity from a country with plentiful clean energy to one that is highly reliant on fossil fuels.

However, physical connectivity alone may not yield the desired results in a cost-effective way. This is best achieved by establishing a multilateral trading platform. Three regions in East Asia are pursuing regional electricity connectivity: Southeast Asia through the ASEAN Power Grid, the Greater Mekong Subregion, and Northeast Asia.

1 Including, possibly, with reference to Article 6.8 of the Paris Agreement.

## ASEAN Power Grid

Physical connectivity between national power grids across the ten ASEAN countries continues to develop through a series of bilateral, inter-state connections dating back to the 1980s, well before an ASEAN Power Grid (APG) was first envisioned in 1997. By the end of 2014, 11 interconnections between six pairs of countries were in commercial operation, with a total capacity of nearly 3,500 MW. Seven of the 11 interconnections involve taking power to Thailand. All 11 projects are underpinned by bilateral agreements covering either power purchase or energy exchange. Another 13 projects, totaling over 7,000 MW, are still under development as of 2017. Most of them are two years or more behind the original schedule, but are due for completion by 2020. Further interconnections, totaling 20,000 MW or more, are envisaged for the period after 2020.

This relatively slow progress reflects the inability or unwillingness of national governments and state-owned utilities to invest. At the same time, many interconnection projects remain commercially unattractive to private investors. The major exceptions are the numerous projects that take power from Laos to Thailand, as Thailand has a great need for more electricity, and Thai prices are commercially competitive.

The first initiative to create a multilateral power market within ASEAN was the Laos-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP) in 2014. The project involved plans to trade up to 100 MW of power, to be wheeled from Laos to Singapore. While the technical aspects of the project were clearly soluble, and the infrastructure was practically in place, issues relating to commercial arrangements and legal and regulatory matters have proved more challenging. In 2016, Singapore withdrew from the project.

The idea of drawing on the Nordic experience with electricity interconnection was first discussed in November 2015. The Nord Pool today is a sophisticated market involving highly developed nations, but its basic mechanisms can be adapted and applied to build regional power markets under quite different circumstances. The most notable example is the Southern Africa Power Pool (SAPP), which allows vertically integrated and state-owned power companies in 12 southern African nations to trade with one another, despite the absence of any liberalization in domestic markets and the persistence of energy subsidies to consumers. A feasibility study to determine if and how this approach might be applied to ASEAN is due to start early in 2018.

## Greater Mekong Subregion

The Greater Mekong Subregion (GMS) organization was established in 1992 with five countries from ASEAN and China, specifically Yunnan and Guangxi. The Asian Development Bank (ADB) provides long-term financial and technical assistance. Most of the APG electricity interconnections mentioned above lie in the GMS region and are based on bilateral

arrangements between the relevant ASEAN member states, as well as three interconnections between ASEAN member states and China. Plans to build a competitive regional power market resulted in the creation of a Regional Power Trading Coordinating Committee (RPTCC) in 2005. Numerous studies have been completed concerning technical, economic, and regulatory issues. In this respect the GMS has made more progress in building a foundation for multilateral trading than has the APG. However, the key obstacle to progress appears to have been the inability of the RPTCC to agree on which country should host the Regional Power Coordinating Center. In June 2016, this issue was formally removed from the agenda of the RPTCC.

## Northeast Asia

Northeast Asia lacks a permanent regional organization for economic and infrastructure coordination. Nevertheless, the possibility of constructing an electricity grid across the region has been under discussion for twenty years or more. At present, only three interconnections exist: between Russia and Mongolia, Russia and China, and China and North Korea. The only regionally-based organization promoting economic cooperation is the Tumen River Initiative, the successor to the Tumen River Area Development Program. The main opportunity is to transmit clean electricity from Russia (hydro) and Mongolia (wind and solar) to China, South Korea, and Japan, all of which are heavily reliant on thermal power. The Asian Development Bank is currently supporting a project to develop a strategy for interconnection between Mongolia, China, South Korea, and Japan.

# GUIDE TO ABBREVIATIONS

| | |
|---|---|
| ADB | Asian Development Bank |
| APG | ASEAN Power Grid |
| ASEAN | Association of Southeast Asian Nations |
| B&R Initiative | China's Belt and Road Initiative |
| BAU | business as usual (referring in this context to levels or quantities of future GHG emissions in the absence of additional policy interventions) |
| CDM | Clean Development Mechanism (Kyoto-Protocol flexible mechanism — an emissions-reduction-credit system) |
| $CO_2$ | carbon dioxide |
| COP | Conference of the Parties to the United Nations Framework Convention on Climate Change (with no modifier, referring to the Convention's legally-constituted governing body; or, for example as "COP-23," to one of the COP's annual meetings) |
| ETS | emissions trading system (or "scheme"; also referred to as "cap-and-trade system") |
| EU | European Union |
| GGGI | Global Green Growth Institute |
| GHG | greenhouse gas |
| GMS | Greater Mekong Subregion (regional intergovernmental organization in Southeast Asia) |
| IET | international emissions trading (Kyoto-Protocol flexible mechanism) |
| ITMO | internationally transferred mitigation outcome (see Article 6.2 of the Paris Agreement) |
| JI | Joint Implementation (Kyoto-Protocol flexible mechanism) |
| JCM | (Japanese government's) Joint Crediting Mechanism |
| K-ETS | Korean Emissions Trading System (or "Scheme") |
| KPX | Korea Power Exchange |
| LTMS-PIP | Laos-Thailand-Malaysia-Singapore Power Integration Project |
| MRV | measurement, reporting, and verification (Ritchie and Park refer to "monitoring, reporting, verification and accreditation [MRVA]" in their brief.) |
| MW | megawatt |

| | |
|---|---|
| NDC | Nationally Determined Contribution (national "pledges" submitted in support of the Paris Agreement) |
| NDRC | (China's) National Development and Reform Commission |
| $NO_X$ | Nitrogen oxides |
| R&D | research and development |
| SAPP | South African Power Pool |
| $SO_2$ | Sulfur dioxide |
| $tCO_2$ | Tons of carbon dioxide emissions |
| $tCO_2e$ | Tons of carbon dioxide emissions equivalent |
| TPS | tradable performance standard |
| UNFCCC | United Nations Framework Convention on Climate Change |

# BIOGRAPHIES

**Philip Andrews-Speed** is Senior Principal Fellow at the Energy Studies Institute at the National University of Singapore. He has thirty five years of experience in the field of energy and resources, starting his career as a mineral and oil exploration geologist before moving into the field of energy and resource governance. Until 2010, he was Professor of Energy Policy at the University of Dundee and Director of the Centre of Energy, Petroleum and Mineral Law and Policy. During 2011–2012, he was a Fellow of the Transatlantic Academy at the German Marshall Fund of the United States in Washington, D.C. His main research interest is the political economy of energy and resource governance, at national, regional, and global scales. He is currently leading a major research project, "Policy and Law for Nuclear Safety and Security." Recent books include *China, Oil and Global Politics* (with Roland Dannreuther), *The Governance of Energy in China: Transition to a Low-Carbon Economy*, and *Want, Waste or War? The Global Resource Nexus and the Struggle for Land, Energy, Food, Water and Minerals* (with five co-authors).

**Toshi H. Arimura** is Professor of Political Science and Economics and Director of the Research Institute for Environment Economics and Management at Waseda University in Tokyo, Japan. Prior to his current position, he was a professor at Sophia University in Tokyo as well as Director of its Center for Environment and Trade Research. His research focuses on climate-change and energy policies, particularly regulations for climate-change air pollution, voluntary environmental actions, and innovation of environmental technology. He is coauthor 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. In 2005, he received an Abe Fellowship and was a vising scholar at Resources for the Future and George Mason University from 2006–2008. Dr. Arimura holds a Ph.D. in economics from the University of Minnesota, an M.Sc. in environmental sciences from the University of Tsukuba, and a B.A. in the history of science from the University of Tokyo. He has served on a number of Japanese government committees on environmental issues and on editorial boards of academic journals such as the *Review of Environmental Economics and Policy* and *Environmental Economics and Policy Studies*.

**Suh-Yong Chung** is a professor in the Division of International Studies at Korea University. Chung also directs the Center for Climate and Sustainable Development Law and Policy (CSDLAP), an independent think-tank. He was also a visiting professor at SciencesPo in Paris in 2014–2015. Chung previously served as a member of Expert Committee of the Presidential Advisory Council on Science, the Compliance Committee of the U.N. Basel Convention as a Vice Chair, and was a member of the Presidential Committee of Green Growth and a member of the Council of the Global Green Growth Institute. Chung has worked on climate-change regime building and environmental cooperation in Northeast Asia. Most recently, he led a

study group on the Northeast Asian Carbon Market, among key experts and government officials funded by the ROK Government. He has also closely cooperated with various leading organizations including but not limited to the Harvard Kennedy School, Asia Society Policy Institute, Environmental Defense Fund, International Emissions Trading Association, Global Green Growth Institute, and International Centre for Trade and Sustainable Development on the issues of Article 6 of Paris Agreement and Carbon Market. He holds degrees in law and international relations from Seoul National University, the London School of Economics, and Stanford University.

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**Robert Heilmayr** is Assistant Professor of Environmental and Ecological Economics at the University of California, Santa Barbara's Environmental Studies Program and the Bren School of Environmental Science and Management. Heilmayr combines approaches from economics, geography, and ecology to explore the way society uses and governs natural resources. Heilmayr's current research focus is on the impact of nonstate policies to end deforestation. He received his B.A. in environment, economics, and politics from Claremont McKenna College and his M.A. in economics and Ph.D. in environment and resources from Stanford University.

**Takashi Hongo** has been a senior fellow at the Mitsui Global Strategic Studies Institute (MGSSI) since October 2011. He analyzes energy and climate-change related policy and markets and proposes market-based policy measures. He is on the Board of Directors at the International Emission Trading Association (IETA) and International Civil Aviation Organization (ICAO) Global Market-Based Mechanism Technical Task Force. He is an international expert for the International Organization for Standardization's Technical Committee 265 (which concerns carbon dioxide capture, transportation, and geological storage) working group that focuses on standardization in connection with enhanced oil recovery-related

carbon dioxide storage. He is Project Manager for Japan's Data Integration and Analysis System (DIAS), a Technology Evaluation Committee member of Japan's New Energy and Industrial Technology Development Organization (NEDO), Policy Advisor to Globe Japan, and a member of various committees for government and public institutions. He has contributed to the review of many reports by International Energy Agency, including *World Energy Outlook*. Before joining MGSSI, he worked for the Japan Bank for International Cooperation as Special Advisor and Head of the Environment Finance Engineering Department.

**Ziting Huang** is a master's student at the Nicholas School of Environment at Duke University, studying energy and environmental management. She is also working on an International Development Policy Certificate from the Sanford School of Public Policy. Her research interest covers global clean energy investment, green development in developing countries, international power market operation, and demand-side energy management. In 2016, she obtained a Bachelor's of Economics degree from China's Renmin University with a specialization in energy economics.

**Valerie J. Karplus** is the Class of 1943 Career Development Assistant Professor of Global Economics and Management at the MIT Sloan School of Management. Karplus studies resource and environmental management in firms operating in diverse national and industry contexts. Her work focuses on the role of institutions and management practices in explaining firm performance. She is an expert on China's energy system, including technology and business model innovation, energy-system governance, and the management of air pollution and climate change. Karplus is engaged in research collaborations in China, India, and Sub-Saharan Africa focused on micro and macro determinants of clean-energy transitions in emerging markets.

**Suzi Kerr** is Senior Fellow at Motu Economic and Public Policy Research, a policy-research institute in New Zealand, and an adjunct professor at Victoria University. From 1998–2009, she was Director and Senior Fellow at Motu. She has also worked at the University of Maryland at College Park, Resources for the Future, the Joint Center for the Science and Policy of Global Change at MIT, and more recently was Visiting Professor at Stanford University in 2009–2010 and at the University of the Andes in Bogotá, Colombia for the first half of 2014. Her current research work focuses on climate change. She empirically and theoretically investigates domestic and international climate-change policy, with special emphasis on emissions pricing and land use in both the tropics and New Zealand. She also leads work on climate-change impacts and adaptation in New Zealand. She has led four policy dialogue processes: one in the lead up to the establishment of New Zealand's emissions-trading system (ETS), on managing water quality in Lake Rotorua, on agricultural greenhouse-gas emissions, and (co-led) on New Zealand's Low Emissions Future. She is currently leading a dialogue on New Zealand's ETS. In 2010, she won the NZIER Economics Award. She graduated from Harvard University in 1995 with a Ph.D. in economics.

**Joojin Kim** is Managing Director of Solutions for Our Climate (SFOC), a Korea-based environmental group, advocating for more effective air and climate policies and restrictions on coal power plant financing. He has over ten years of experience with the international climate-change regime, including serving as member of the delegation of the Republic of Korea to the 2009 Copenhagen United Nations Climate Change Conference. He is also an attorney-at-law and has been admitted to the Korean and Illinois Bars. He served as Legal Advisor to the Presidential Committee on Green Growth of the Republic of Korea and frequently advised the Korean Government on greenhouse-gas and renewable-energy-related matters. Until recently, Kim worked for Kim & Chang, Korea's largest law firm, mainly representing power industry clients, including the Korea Development Bank, Samsung, and Macquarie, in their energy and climate-related projects, financial transactions, and litigations. He also has extensive experience with emissions trading and greenhouse-gas regulations, accumulated while advising clients on their emission-reduction projects. He holds an LL.M. in environmental law from Georgetown University Law Center and a master's degree in environmental management from Seoul National University.

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**Ruben Lubowski** is Chief Natural Resource Economist at the Environmental Defense Fund (EDF). He is a leading expert on carbon-market design and works with external researchers, policymakers, advocates, and investors to analyze, design, and implement carbon markets and other approaches to address global climate change. He co-authored the World Bank–ICAP handbook on Emissions Trading System design, which policymakers around the world are using to develop market programs to reduce carbon emissions. He is also widely recognized for

his expertise in modeling land-use changes and on policy and finance approaches for reducing emissions from deforestation, agriculture, and bioenergy activities in the United States and internationally. He has testified before the U.S. Senate on the role of forests and agriculture offsets and served as a land-use expert at the U.S. Department of Agriculture. He has additional experience on environment and development issues from work at the Harvard Institute for International Development and United Nations Development Programme. Lubowski has also taught environmental economics and policy as an adjunct professor at Columbia University's School of International and Public Affairs. He received his Ph.D. and master's degree in political economy and government and his bachelor's degree from Harvard University.

**Michael Mehling** is Deputy Director of the Center for Energy and Environmental Policy Research (CEEPR) at the Massachusetts Institute of Technology (MIT) and Professor of Law at the University of Strathclyde. He is Editor-in-Chief of the quarterly *Carbon & Climate Law Review*, an 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 (IUCN-US) and Ecologic Institute in Berlin and Washington, D.C. Previously, Mehling was the founding president of Ecologic Institute in Washington, D.C., and has held research and teaching appointments at Georgetown University and the Universities of Greifswald, Helsinki, and Konstanz. 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.

**Gilbert E. Metcalf** is Professor of Economics at Tufts University where he serves as the Graduate Program Director in the Department of Economics. In addition, he is a research associate at the National Bureau of Economic Research, an associate scholar in the Harvard Environmental Economics Program, and a University Fellow at Resources for the Future. Metcalf's primary research area is applied public finance with particular interests in taxation, energy, and environmental economics. His current research focuses on policy evaluation and design in the area of energy and climate change. Metcalf received a B.A. in mathematics from Amherst College, an M.S. in agricultural and resource economics from the University of Massachusetts Amherst, and a Ph.D. in economics from Harvard University.

**Lingshui Mo** is a climate and energy policy expert in Asian Development Bank (ADB), where she develops knowledge products to serve emerging carbon-market development and carbon-market linkage in Asia and the Pacific; assess the feasibility of establishing regional integrated carbon markets in Asia and the Pacific region; and develop guidance on facilitating regional carbon-market integration. She also provides technical advice and support to ADB in establishing climate technology financing mechanisms; assesses the impact of Nationally Determined Contributions (NDCs) on the energy sector of ADB's Developing Member Countries (DMCs) and identifies the needed policy instruments, technology options, and financing requirements for DMCs to achieve their NDC commitment. She is the lead author

of *Emission Trading Schemes and their Linking: Challenges and Opportunities in Asia and the Pacific*. Before she worked for ADB, Mo was Qualification Director in Camco Carbon Credit Limited (Beijing, China), where she managed the team developing China's qualified Clean Development Mechanism projects portfolio. From 1991–2003, she worked in the Guangxi Development and Reform Commission. She was Deputy Director of the Planning Division and in charge of developing the Five Year economic development plan, economic policy formulation, regional planning and urban infrastructure investment planning, and assessing and approving urban infrastructure projects. She holds a master's degree in economics and an M.A. in international finance.

**Hyungna Oh** is a professor at the College of International Studies at Kyung Hee University, with expertise in the fields of climate change, simulation methods, and platforms for circular economies and community development. Before she joined Kyung Hee University, she served as a Fellow with the Korea Development Institute (KDI) as well as Assistant Professor of Economics at West Virginia University. During her time with KDI, Oh assisted the Korean Ministry of Strategy and Finance (MOSF) in hosting the Green Climate Fund and helped design a cap-and-trade system for Korea (K-ETS). Recently, she has conducted research on the Decree of the K-ETS, Master Plans for Phase I and II, as well as the revision of the Strategic Environmental Assessment in Korea. Her work has appeared in academic journals including *Climate Policy* and the *Economics Letters*. Oh currently serves as a member of the Green Growth Committee, the Allocation Committee of the K-ETS, the Tax and Public Finance Committee, the $CO_2$ Absorption Committee for the Korea Forest Service, and the Advisory Board for the Korea Chamber of Commerce & Industry. Oh received her Bachelor's and Master's degrees in economics at Korea University and her Ph.D. from Cornell University.

**Il-Young Oh** is Director of Korea's Ministry of Environment. He has worked as a deputy director and director in the field of climate-change policy, green economy and technology, and water management at the Ministry of Environment since 1999. He has led the Korea Emissions Trading Scheme (K-ETS) Division at the Ministry of Environment in 2015–2016 and at the Ministry of Finance and Strategy in 2016–2017. Prior to directing K-ETS, Oh was First Secretary and Environmental Attaché at the Republic of Korea Embassy's Bonn Office in Germany during 2012–2015. He was also a member of the delegation of Republic of Korea to the United Nations Framework Convention on Climate Change's Conferences of the Parties (COPs) and sessions of the Intergovernmental Panel on Climate Change's Working Group 3 during this period. He also contributed, as a team leader, to the establishment of the Greenhouse Gas Inventory and Research Center (GIR), which manages the greenhouse gas national inventory and greenhouse gas reduction research in 2010–2011. Oh holds a B.A. and M.S. in mineral and petroleum engineering from Seoul National University. He studied climate-change mitigation at the Centre for Environment and Sustainability at the University of Surrey from 2007–2009.

**C.J. Park** has worked since January 2016 as a key expert for the EU-Korea ETS Project, a 3-year-long bilateral cooperation project funded by the European Union. He is responsible for the overall operation of the Project Team for 3 years and supports the EU Team Leader. He has also been working with the International Emissions Trading Association, as a consultant for Korean market, since June 2009. Since 2005, Park has also operated his own consulting firm, ZeroCarbon Inc., which specializes in carbon markets and emissions-trading systems in Seoul. Before the above carbon market-related career, he worked for Samsung, DuPont, and General Electric, mostly in the field of development and management of environmental projects.

**Alistair Ritchie** is a leading expert in climate mitigation policy, especially Emissions Trading Systems (ETS) with over twenty-five years of consulting experience. He founded Ritchie Policy Consulting in 2015 following successfully developing the climate policy business at ICF International and the environmental policy business at Entec (now Amec Foster Wheeler). He has managed, directed, and delivered a significant number of pioneering and influential projects on the development of the EU ETS including the Phase 3 and 4 designs. He is now Team Leader for the major European Commission (EC) technical assistance project to support implementation and upgrade of the Korean ETS (K-ETS) — the first national ETS in East Asia. Previously, he was Technical Director for a major EC project to support the development of China's National ETS. Ritchie also has substantial experience in carbon capture and storage, low-carbon fuels, energy efficiency, shale gas, and air-pollution policy.

**Robert N. Stavins** is the A. J. Meyer Professor of Energy & Economic Development at the Harvard Kennedy School, Director of the Harvard Environmental Economics Program, Director of Graduate Studies for the Doctoral Programs in Public Policy and Political Economy & Government, Co-Chair of the Harvard Business School–Kennedy School Joint Degree Programs, and Director of the Harvard Project on Climate Agreements. He is a University Fellow of Resources for the Future, a Research Associate of the National Bureau of Economic Research, Co-Editor of the *Review of Environmental Economics and Policy* and the *Journal of Wine Economics*, and a member of the Board of Directors of Resources for the Future and the Scientific Advisory Board of the *Fondazione Eni Enrico Mattei*. He is an elected Fellow of the Association of Environmental and Resource Economists. He was formerly Chairman of the Environmental Economics Advisory Committee of the U.S. Environmental Protection Agency's Science Advisory Board. He has been a Lead Author of the Second, Third, and Fifth Assessment Reports of the Intergovernmental Panel on Climate Change. His research has focused on diverse areas of environmental economics and policy, and has appeared in leading economics, law, and policy journals, as well as a dozen books. He has been a consultant to the several Administrations, Members of Congress, environmental advocacy groups, the World Bank, the United Nations, state and national governments, and private foundations and firms. He holds a B.A. in philosophy from Northwestern University, an M.S. in agricultural economics from Cornell, and a Ph.D. in economics from Harvard.

**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 in Public Policy at HKS, teaching a course on international climate-change policy and advising students on this set of topics. Stowe 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. Stowe has worked in non-profit, academic, and business organizations, including as Vice President of Programs of the Citizens Network for Foreign Affairs, which provides assistance in agriculture and agri-business to developing countries, and as a consultant to the World Bank and other organizations. Stowe holds a Ph.D. in political science from the Massachusetts Institute of Technology and a B.A. in physics from Harvard College.

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**Fei Teng** is Associate Professor of the Institute of Energy, Environment, and Economy at Tsinghua University and Deputy Director of Tsinghua-Berkeley Joint Reseach Center on Energy and Climate. He is also a lead author of the Intergovernmental Panel on Climate Change 5th assessment report's Working Group III. He is the lead author of China's second and third National Assessment Report on Climate Change, member of the drafting team for several key national documents, including the National Plan on Climate Change and White Paper on Climate Change. Teng has served as an advisory expert for China's negotiation team on mitigation and transparency under the United Nations Framework Convention on Climate Change for many years. In 2014, he was selected as the chair of the Consultative Group of Experts on National Communication to non-Annex I parties (CGE). He was the chief scientist of China's National Basic Research Program on Comparability and Measuring, Reporting, and Verification (MRV) in mitigation actions. His research interests include: climate policy, international climate regime, consumer behavior in energy consumption, and energy modeling.

**Junjie Zhang** is Director and Associate Professor in the Environmental Research Center and Master of Environmental Policy (iMEP) Program at Duke Kunshan University and Associate Professor of Environmental Economics in the Nicholas School of the Environment at Duke University. He is also a senior adviser of the Asia Society. Prior to his current position, he was an associate professor in the School of Global Policy and Strategy at the University

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**Xiliang Zhang** is Professor of Management Science and Engineering, Director of the Institute of Energy, Environment and Economy, and Director of the China Automotive Energy Research Center — all at Tsinghua University. Zhang is the leader of the experts group appointed by the National Development and Reform Commission (NDRC) for designing China's national carbon emissions trading system. He is leading a four-year project "Green and low-carbon economy transformation management and policy" which was founded by the National Natural Sciences Foundation of China. He was the principle investigator for the research project "China's mid- and long-term low carbon development strategy" which was sponsored by the Ministry of Science and Technology with the support of the NDRC during 2012–2016. Zhang also coordinated a research project, "China Energy Revolution: targets, pathways and policies," organized by the NEA (National Energy Administration) during 2014–2015. He was co-leader of the expert group that drafted the "China Renewable Energy Law" during 2004–2005 and was an energy expert of the expert group that drafted the "China Circular Economy Law" in 2007, both commissioned by the Environmental Protection and Resource Conservation Committee of the National People's Congress. Zhang has been a lead author of the 4th and 5th IPCC Climate Change Assessment Report. He is Chair of both the Energy Systems Engineering Committee and the China Energy Research Society, and Vice President of the China Renewable Energy Industry Association. Zhang received his Ph.D. in Systems Engineering at Tsinghua University in 1997.

# International Cooperation in East Asia to Address Climate Change

Research Workshop Sponsored by the Harvard Project on Climate Agreements
September 27, 2017
Harvard Center Shanghai

## Agenda

All sessions at Harvard Center Shanghai; 5/F, Shanghai IFC-HSBC Building; 8 Century Avenue; Pudong, Shanghai; https://shanghaicenter.harvard.edu

**8:15 – 9:00** Breakfast available

**9:00 – 9:20** Welcome, overview, and self-introductions

Robert STAVINS, Harvard University

**9:20 – 10:05** Status and prospects for domestic climate-change policy and international cooperation in East Asia:

Takashi HONGO, Mitsui Global Strategic Studies Institute (Japan)
ZHANG Xiliang, Tsinghua University (People's Republic of China)
Joojin KIM, Solutions for Climate Change (Republic of Korea)

**10:05 – 10:35** Responses

Valerie KARPLUS, Massachusetts Institute of Technology
CJ PARK, EU-Korea ETS Project
QIAN Guoqiang, SinoCarbon

**10:35 – 11:00** Break

**11:00 – 11:45** Discussion

**11:45 – 12:45** Lunch

**12:45 – 13:15** Heterogeneous linkage and the Paris Agreement

Michael MEHLING, Massachusetts Institute of Technology
Robert STAVINS, Harvard University

## International Cooperation in East Asia to Address Climate Change

### Agenda (cont.)

**13:15 – 13:35** Responses

Lingshui MO, Asian Development Bank
Shiro TAKEDA, Kyoto Sangyo University

**13:35 – 14:00** Discussion

**14:00 – 14:10** Possible future linkage among emissions trading systems in East Asia

Hyungna OH, Kyung Hee University

**14:10 – 14:20** Status and prospects for the Paris Agreement's Article 6: Implications for cooperation in East Asia

Suh-Yong CHUNG, Korea University

**14:20 – 14:30** Response

TENG Fei, Tsinghua University

**14:30 – 15:00** Discussion

**15:00 – 15:15** Break

**15:15 – 15:30** Cooperation and emissions price harmonisation without linking: prospects for "climate teams" in East Asia

Suzi KERR, Motu Economic and Public Policy Research

**15:30 – 16:00** Non-market approaches to cooperation in East Asia

CHAI Qimin, National Center for Climate Change Strategy and International Cooperation
Philip ANDREWS-SPEED, National University of Singapore
ZHANG Junjie, Duke-Kunshan University

**16:00 – 16:45** Discussion

**16:45 – 17:00** Conclusions, next steps, close

# International Cooperation in East Asia to Address Climate Change

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## Participants

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