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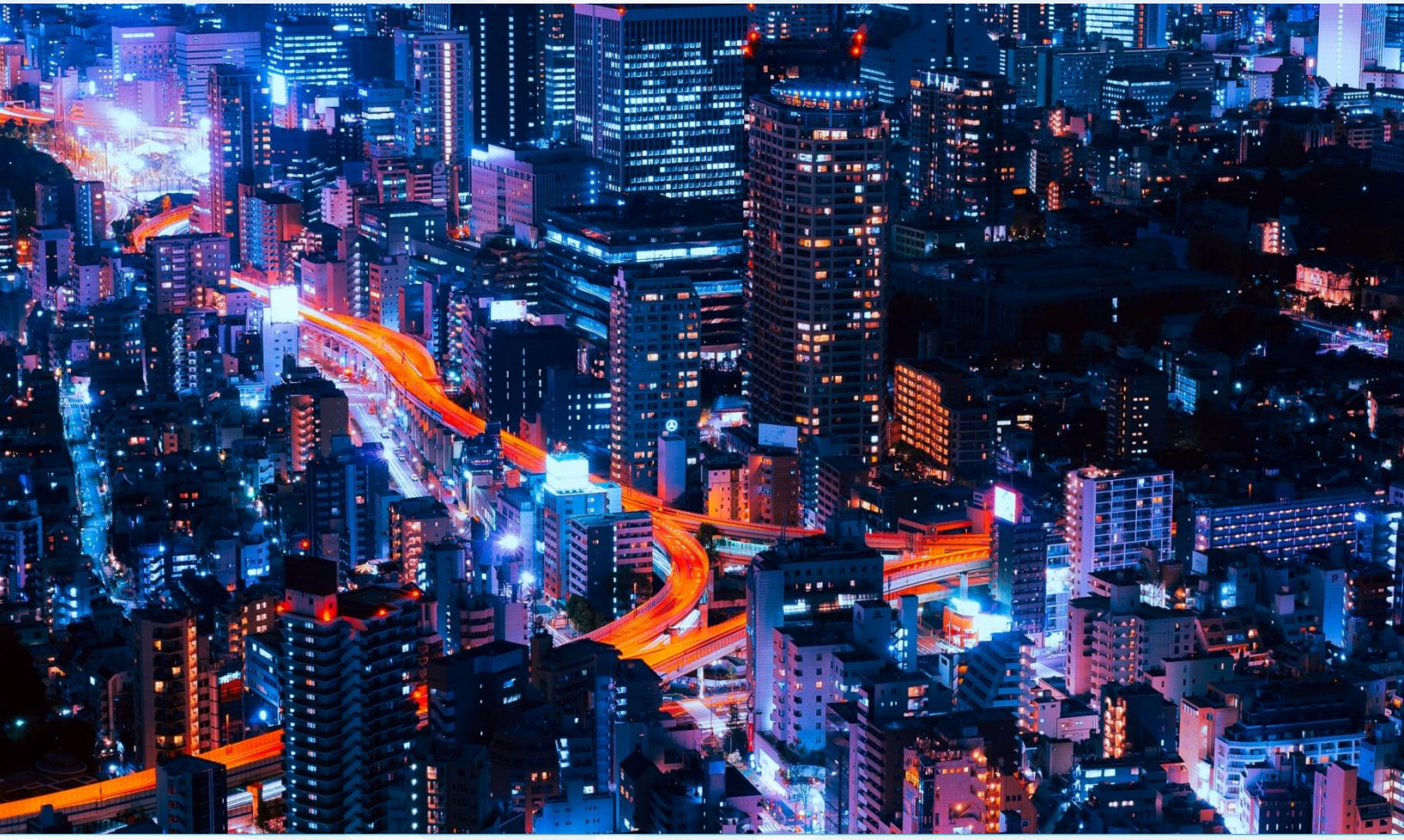
GØRILD M. HEGGELUND, ISELIN STENSDAL AND JØRGEN WETTESTAD

Linking Asian carbon markets: opportunities and barriers



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Linking Asian carbon markets: opportunities and barriers

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Abstract

Northeast Asian countries are emerging as major players in development and operation of carbon markets. Already connected through economic ties, these countries also share environmental challenges. Expert reports have therefore called for the countries to link their respective carbon markets, as this could offer economic, environmental, and strategic benefits.

With this report we offer an overview of the status of carbon markets in key economies in Asia today. Our main focus is China, Japan and South Korea, but we also cover Kazakhstan. All four countries have developed and operated carbon markets. This report identifies positive experiences as well as existing bottlenecks and barriers to a possible future linking of carbon markets among these countries. We also give a brief introduction to markets that are running, planned or have been shelved in the Asia-Pacific region.

The report looks into the following aspects: what is the status of carbon markets in these key economies; what are key general lessons about the linking of carbon markets so far; what are the main similarities and differences between main Asian carbon markets; what are key challenges and prospects for a linked North Asian carbon market.

We find that countries are increasingly showing interest in employing market mechanisms to control GHG emissions. From a global framework perspective, the upcoming COP26 in Glasgow 2021 may contribute to setting the stage for international carbon trading. We note positive trends and opportunities for linking between carbon markets in North East Asia. A pull in a positive direction is that Japan, South Korea and China initiated academic exchanges on potential for linking emissions trading systems in the future; and they already have various types of carbon markets at the national or subnational level. Japan, South Korea and China all have carbon-neutrality goals (of 2050, 2050 and 2060 respectively), which may provide an incentive to explore the possibilities of linking carbon markets. We find that an ETS linking between Korea and China appears more feasible, given the many similarities between the national schemes. However, considerable differences remain in policy design and implementation status: the carbon markets differ in size, structures, design, and the markets are at different stages of development.

Finally, the report has highlighted the need for a deeper understanding of several aspects of carbon-market linkage. Establishing a North East Asian regional carbon market hub could have economic, environmental, and strategic benefits for the region, as well as globally. Further in-depth study is needed of how to resolve the challenges involved in linking differently structured, designed and functioning markets.

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Abbreviations

APEC	Asia-Pacific Economic Cooperation
CAREC	Central Asia Regional Economic CAREC Cooperation
CCERs	Chinese Certified Emissions Reductions
CDM	Clean Development Mechanism
EEA	European Economic Area
ETS	Emissions Trading Scheme
EVs	Electric vehicles
FYP	Five-Year Plans
GDP	Gross domestic product
GHG	Greenhouse gas
JCM	Joint Crediting Mechanism
MEE	Ministry of Ecology and Environment
METI	Ministry of Economy, Trade and Industry
MRV	Monitoring, Reporting, Verification
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NEA	National Energy Administration
UNFCCC	United Nations Framework Convention on Climate Change
WCI	Western Climate Initiative

1. Introduction and context

Northeast Asian countries are emerging as major players in development and operation of carbon markets. Already connected through economic ties, these countries also share environmental challenges. Expert reports have therefore called for the countries to link their respective carbon markets, as this could offer economic, environmental, and strategic benefits.[1] In economic terms, such regional linking could reduce the costs of emissions reductions by creating options for purchasing permits that are cheaper than those available at home. Linking markets could also gain more buyers and sellers, as well as improved market liquidity. For the environment, links could cut carbon price differentials across the region, reducing the movement of emitting activities from one jurisdiction to another (leakage). Importantly, the success of a large, linked carbon market might incentivize other regions to use carbon pricing or to join. Further, lower emissions reduction costs might possibly open the way to more ambitious climate change goals, although no such effects seem to have occurred so far. Notably, linking Northeast Asian markets could build confidence in a wider regional Asian carbon market hub, and create a stronger cooperation basis for countries already closely connected by trade and geopolitical challenges and opportunities. However, there are many challenges involved in linking emissions trading schemes (ETS), as previous attempts have shown (see section 4).

Bearing this in mind, with this report we offer an overview of the status of carbon markets in key economies in Asia today. Our main focus is China, Japan and South Korea, but we also cover Kazakhstan. [2] All four countries have developed and operated carbon markets. This report identifies positive experiences as well as existing bottlenecks and barriers to a possible future linking of carbon markets among these countries. We also give a brief introduction to markets that are running, planned or have been shelved in the Asia-Pacific region.

We ask:

- What is the status of carbon markets in these key economies?
- What are key general lessons about the linking of carbon markets so far?
- What are the main similarities and differences between main Asian carbon markets?
- On the basis of the above, what are key challenges and prospects for a linked North Asian carbon market?

We begin by introducing theoretical and empirical insights in section 2; then in section 3, the selected case countries and their status, domestic political structures, carbon-market design elements and regional cooperation are presented. In section 4 we tie the previous sections together by drawing lessons learned of relevance for future linking of these markets. Finally, section 5 presents concluding remarks and recommendations.

[1] J. Ewing, 2018. *Carbon Market Cooperation in Northeast Asia: Assessing Challenges and Overcoming Barriers* FULL REPORT: Carbon Market Cooperation in Northeast Asia.pdf (asiasociety.org)

[2] On nomenclature: People's Republic of China hereafter China; Republic of Korea hereafter South Korea; Republic of Kazakhstan, hereafter Kazakhstan

2. Linking carbon markets: key theoretical and empirical insights

Carbon trading markets may be linked in various ways. With a *direct* link, companies within system A may use allowances from system B to meet obligations within system A. One example of such a link is the one between the EU ETS and the Swiss ETS, which became operational in 2020. An *indirect* link between systems A and C will exist if both are linked to system B, but not to each other: given the respective linkages to system B, developments within system A will probably affect system C via system B.[3]

Linking carbon markets may entail benefits, and costs. As to the benefits, linking separate emissions trading systems means that allowances in one system may be used to meet obligations for reducing emissions in another system, which could 'narrow or eliminate differences in the marginal cost of abatement between different regions or countries.[4] This is expected to level the playing field for industry as well as direct investments in emissions reduction to areas where this can be achieved at the lowest cost. This can also assuage industry fears about an uneven global regulatory playing field and related 'carbon leakage'.[5] Further, this could help countries ratchet up their ambitions more than in a situation without such mechanisms.[6] Linking could also bring extra demand for allowances and help to counteract the problems of oversupply and low carbon price (as experienced by the EU ETS) and improve liquidity.[7] Thus, linking can lower the overall costs of emissions reduction, reduce price volatility, improve market liquidity, and generally facilitate the ratcheting up of national ambitions regarding emissions reductions. Moreover, linking can carry political prestige: governments may place special importance on linking their carbon market to others.[8]

However, linking may also entail economic and political costs. Given the sharp differences in purchasing power around the globe, it may have strong distributional effects. Linking could also lead to the export and import of problems experienced by one of the systems: difficulties within system A might become a challenge for system B – for instance, market imbalance in system B due to over-allocation in system A. Moreover, numerous other climate and non-climate related taxes, subsidies and regulations already exist – so linking alone is not sufficient to ensure a level playing field.

Linking can give rise to complex issues of distribution of powers and competences between jurisdictions. Once linked, design choices in system A will influence the operation of system B, and vice versa.

[3] J. Jaffe, M. Ranson, R.N. Stavins, 2009. 'Linking tradable permit systems: A key element of emerging international climate policy architecture', 36(4) *Ecology Law Quarterly*, 789–808.

[4] D. Burtraw, K.L. Palmer, C. Munnings, P. Weber, M. Woerman 2013. *Linking by degrees: Incremental alignment of cap-and-trade markets* [Online]. Resources for the Future 13-04. www.rff.org/publications/working-papers/linking-by-degrees-incremental-alignment-of-cap, Dand-trade-markets/ A. Kachi, C. Unger, N. Böhm, K. Stelmakh, C. Haug, & M. Frerk, (2015). *Linking emissions trading systems: A summary of current research* [Online]. International Carbon Action Partnership Policy Paper. Available: https://icapcarbonaction.com/en/?option=com_attach&task=download&id=575; Jaffe et al., 2009.

[5] C. Flachsland, R. Marschinski, O. Edenhofer, 2009. 'To link or not to link: Benefits and disadvantages of linking cap-and-trade systems', *Climate Policy*, 9(4): 358–72, at 363.

[6] M.A. Mehling, G.E. Metcalf, R.N. Stavins, 2018. Linking climate policies to advance global mitigation. *Science,* 359**,** 997–998; M. Santikarn, L. Li, S.L.H. Theuer, C. Haug, C. 2018. *A Guide to Linking Emissions Trading Systems* [Online]. Berlin: ICAP. www.icapcarbonaction.org/publications

[7] E. Haites, 2014. *Lessons learned from linking emissions trading systems: General principles and applications* [Online]. Washington DC: Partnership for Market Readiness (PMR). www.thepmr.org/system/files/documents/PMR%20Technical%20Note%207.pdf

[8] C. Unger, 2020. Emissions trading systems – when do they link and when not. Ph.D. dissertation, Berlin, TUM School of Governance.

If system A is poised to implement changes, should then system B be consulted and have co-decision power? Such negotiations might complicate ETS reform processes. Regardless of whether linked partners agree to make adjustments to their respective ETS only after joint negotiations, linking will entail some loss of political control over system A – whether due to the political influence granted to system B, or to system B's impact on system A. In general, linking might face a considerable political feasibility challenge: despite the obvious economic benefits, the resistance of central political actors, uncertain about distributional effects, may render linking efforts complicated or futile.[9] Furthermore, if the linkage takes place across different sectors (for example, when the ETS covers the electricity sector in one country and the second country's ETS covers the transportation sector), the linked system as a whole will adopt the stringency of the least ambitious sector.[10] Generally, the establishment of a successful link between two carbon markets is seen as facilitated by basic compatibility of designs, prior close political and economic ties and a certain geographical proximity between the parties. A functioning and institutionalized cooperative relationship is advantageous for linking; but compatibility as regards the level of climate-policy ambition,[11] the rules determining offset use,[12] and the design of price/supply management mechanisms such as a price floor/ceiling [13] have all been identified as essential. All in all, as indicated in the brief summary above, the more general and theoretical discussion of carbon-market linking is quite extensive. However, actual evidence of linking is rather sparse, with only a few successes and some failures.

The main successful direct international links so far are three: 1) Norway, Iceland and Lichtenstein linking up to the EU ETS in 2008 (in the context of the European Economic Area agreement); 2) Quebec linking up to the Californian ETS in 2014 (in the context of the Western Climate Initiative; 3) Switzerland linking up to the EU ETS in 2020 (with negotiations starting back in 2010).

As to failed efforts, between 2007 and 2011 there were meetings and discussions about a possible California–EU carbon market link, but these never progressed to formal negotiations.[14] A much more formal process unfolded between Australia and the EU, notably between 2011 and 2013. In 2012 it was agreed that linking was to be implemented in stages: an interim unilateral link from 2015 where only Australian companies were to use EU allowances for compliance; and then a full bilateral link from 2018 on. However, political upheaval in 2013 intervened: the incoming Prime Minister Tony Abbott halted the development of carbon pricing policy and hence also the linking process.[15]

Lessons for a potential East Asian market

From theory and linking experience to date, we have identified four key lessons for linking efforts. We

[9] J.F. Green, T. Sterner, G. Wagner, 2014. 'A balance of bottom–up and top–down in linking climate policies', *Nature Climate Change,* 4: 1064–1067; L.H. Gulbrandsen, J. Wettestad, D.G. Victor, A. Underdal, 2019. The political roots of divergence in carbon market design: implications for linking. *Climate Policy,* 19**,** 427–438; Unger, 2020 (fn. 8 *infra*).

[10] D. Cullenward, D.G. Victor, 2020. *Making Climate Policy Work*, Cambridge, UK: Polity Press.

[11] See e.g. Green et al. 2014 (fn. 9 *infra*); also W. Sterk, R. Schüle, 2009. Advancing the climate regime through linking domestic emission trading systems? *Mitigation and Adaptation Strategies for Global Change*, 14(5), 409–431. A. Tuerk, M. Mehling, C. Flachsland, & W. Sterk, 2009. Linking carbon markets: concepts, case studies and pathways. Climate Policy, 9, 341-357. Haites, 2014 (fn. 7 *infra*).

[12] Burtraw et al., 2013 (fn. 4 infra); L. Zetterberg 2012. *Linking the emissions trading systems in EU and California* [Online]. Fores, Swedish Environmental Research Institute. https://fores.se/wp-content/uploads/2013/04/FORES-California_ETS-web.pdf;
S. Hawkins ,I. Jegou, 2014. *Linking Emissions Trading Schemes: Considerations and Recommendations for a Joint EU–Korean Carbon Market* [Online]. ICTSD Global Platform on Climate Change, Trade and Sustainable Energy www.ictsd.org/sites/default/files/research/linking-emissions-trading-schemes-considerations-and-recommendations-for-a-joint-eu-korean-carbon-market.pdf

[13] M. Ranson, R.N.Stavins, 2016. Linkage of greenhouse gas emissions trading systems: learning from experience. *Climate Policy,* 16**,** 284–300; Burtraw et al., 2013 (fn. 4 infra)

[14] Unger (2020) provides a good overview and discussion of the EU–California process (see fn 8. infra).

[15] See I. Bailey, T.H.J. Inderberg, 2018. Australia: domestic politics, diffusion and emissions trading design as a technical and political project, in J. Wettestad, L.H. Gulbrandsen, *The Evolution of Carbon Markets: Design and Diffusion*, London: Routledge, 124–145.

return to these lessons in greater detail in part 4, and discuss their implications for the Asian context.

1. **Linking is complex and tends to take time**.

The prime example here is the process of linking the Swiss ETS up to the EU ETS, which took 10 years. This shows that even efforts at linking between actors with high geographical proximity and substantial economic ties and interest in linkage may take time. This indicates the advantages of a solid mutual learning and information exchange process.

2. **Successful linking has been regional and within broader cooperative umbrellas.**

The prime example here concerns the EU and Norway within the European Economic Area (EEA), but also to some extent California–Quebec within the Western Climate Initiative (WCI). Broader cooperative umbrellas seem to accord some protection against political upheavals (although it did not prevent Ontario from stopping the California link within the WCI)

3. **Carbon pricing and linking of such systems have distributional (power) implications; disadvantaged actors may mobilize in opposition.**

Evidence from several cases, Australia not least, indicates the importance of focusing on design factors that can readily be linked, and that linking should be approached in gradual stages.

4. **Starting with 'compatible' designs and openness to stepwise linking make progress more likely.**

A basic similarity in the level of ambition, the rules determining offset use, and the design of price/ supply management mechanisms appears essential. Further, in several cases of successful linking, the smaller parties deliberately adapted their design to that of the larger party. For instance, the Norwegian ETS was designed to be 'linkable' from the very start. In the EU–Switzerland case, Switzerland decided in 2013 to make its ETS similar to the EU ETS in order to facilitate linking. Hence, willingness to adapt designs stands out as an important facilitator in this context. Further, a more partial and stepwise approach should be kept in mind: designing linkage systems that do not attempt full-blown linkage but rather aim for political simplicity. For example, it might be easier to harmonize carbon floor prices (minimum prices) than attempting to work out a full linking scheme.

3. Case countries

Here we examine the case countries: the status of their carbon markets, how they are organized, what interests exist among key stakeholders (pro and con linking), carbon-market design and whether carbon-market cooperation is on the agenda.

China: Pilots and national system[16]

Status for carbon market

China decided to establish a carbon market as part of its 12th FYP (2011–2015), recognizing the need to 'let the market play a fundamental role in resource allocation'.[17] This was in line with the deepening of market reform and economic restructuring, as decided at the 18th Communist Party Congress in November 2012.[18] A national emissions-trading system (ETS) would be one of several policy tools for reducing GHG emissions. China began preparing a national ETS, planned to begin operation in 2017. Seven pilots were launched in 2013 and 2014 to gain experience for use in the national ETS.

In late 2017, the national carbon market was politically launched. It was decided to start with the power sector, the largest emitting sector, and initially cover coal- and gas-fired power plants.[19] The plan was to have a two-year trial period, begin real trading by 2021, with gradual inclusion of sectors a later time. A test of the national registry (in Hubei province) was performed in August 2020.[20] Importantly, in January 2021 the Ministry of Ecology and Environment issued final rules for its national ETS, 'Administrative Measures for Carbon Emissions Trading (Trial)', having solicited public opinions on these measures. The National Measures, effective 1 February, provide the regulatory basis for a Chinese carbon market, and mark a significant step towards getting it operational.[21] The first phase includes 2,225 companies from the power sector, with a minimum of 26,000 CO_2 equivalents in annual emissions in the period 2013–2019.[22] Permits will be handed out for free based on a benchmarking system. However, these Measures are departmental regulations (not approved by the State Council), and lower in the legal hierarchy. The newly released guidance from MEE on climate change and the environment could provide opportunity in the future to anchor the ETS on climate change legislation.[23] The ETS trading rules included the option for emitters to use Chinese Certified Emissions Reductions (CCERs) in order to meet up to 5% of their compliance obligations from the first year of the scheme.[24]

[16] Based on G. Heggelund, I. Stensdal, M. Duan, J. Wettestad. 2019. China's development of ETS as a GHG mitigating policy tool: a case of diffusion or domestic drivers? *Review of Policy Research* 36 (2):168–194 https://onlinelibrary.wiley.com/doi/abs/10.1111/ropr.12328

[17] NDRC 2011. Notice on Carrying out Carbon Emissions Trading Pilots. NDRC's Climate Department notice no. 2601. www.sdpc.gov.cn/zcfb/zcfbtz/201201/t20120113_456506.html. Accessed 13 July 2016, in Chinese.

[18] Central Committee of the Chinese Communist Party (CCPCC), 2013. Communique of the third plenary session of the 18th Chinese Communist Party Central Committee. www.china.org.cn/china/third_plenary_session/2014-01/15/content_31203056.htm

[19] China's Emissions Trading Scheme – Analysis – IEA

[20] S. Reklev, 2020a. China performs first test of national ETS registry, *Carbon Pulse,* 2 August, https://carbon-pulse.com/107576/

[21] S. Reklev, 2021. China adopts ETS trading rules as carbon market gets closer to going live, *Carbon Pulse,* 5 January, (carbon-pulse.com); Ministry of Ecology and Environment (2021.) Administrative Measures for Carbon Emission Trading (Trial) (in Chinese) (mee.gov.cn); (fn 21 infra)
S. Reklev, 2020b. China releases draft rules for national CO2 emissions trading scheme*, Carbon Pulse*, 3 November, https://carbon-pulse.com/113565/

[22] S. Reklev, 2021. China adopts ETS trading rules … *Carbon Pulse* 5 January, (carbon-pulse.com); M.H. Hirth, (2021) Kinas kvotesystem trer i kraft 1. februar – Energi og Klima.no

[23] MEE 2021. Guiding opinions on coordinating and strengthening the work related to climate change and ecological environmental protection (in Chinese) www.mee.gov.cn; QUICK TAKE: Unpacking China's climate change guidance, *Carbon Pulse* (carbon-pulse.com)

[24] S. Reklev, 2021 (fn 21 *infra).*

Political structures, organization and interests

According to the new Measures, China's national ETS is to have a multi-level governance system, and be a CO_2-intensity-based trade scheme with unified rules for all provincial-level regions.[25] The central authorities issue the regulations and overall allocation targets/quotas. The provinces have responsibility for implementation and distribution of allowances to the enterprises. Responsibility to oversee compliance with rules is assigned to the provincial authorities. Seven ETS pilots were initiated in 2013–2014: Beijing, Tianjin, Shanghai Guangdong, Shenzhen, Chongqing and Hubei, representing a range of economic, social and geographic criteria. Fujian launched its ETS in September 2016; this is a regional ETS market in China. The piloting regions were granted full flexibility, thus ensuring pilot system diversity. According to the 2020 Carbon Pricing Survey, 'as of October 30, 2020, over 425 million tonnes worth of allowances had been traded in the primary and secondary markets since the markets began, with a value of CNY 9.86 billion'.[26] Prices in the pilots vary greatly, perhaps due to such factors as over-allocation of allowances to ecology and environment bureaus (EEBs)[27] Beijing reached the highest allowance price, peaking at 102.96 RMB/ tCO_2 on August 20, 2020; Shenzhen had the lowest, 3.03/tCO_2 on May 10, 2019.[28] There is no possibility to borrow allowances from the national system; and regional allowances may not be used in the national system.[29]

National responsibility lies with the Ministry of Ecology and Environment (MEE), which took over the climate-change portfolio from the National Development and Reform Commission (NDRC) in 2018, including the carbon market.[30] The NDRC and the National Energy Administration (NEA) retained responsibility for the energy sector, necessitating close coordination among MEE, NDRC and NEA. Substantial reforms in the power sector being implemented in parallel with the carbon market may positively impact carbon trading.[31]

Carbon market designs

The national ETS in China begins with the power sector and is expected to be gradually expanded to include seven more selected sectors: petrochemical, chemical, building materials, steel, nonferrous metals, paper, and domestic aviation. There is no specific timeline for this expansion.

Initially, the national system will cover only CO_2, but may gradually include other GHGs. All the pilot schemes cover both direct and indirect emissions of CO_2, whereas Chongqing is the only pilot to cover six GHGs (see Table 1). The national ETS will be initiated mainly with allowances distributed for free initially, based on intensity benchmarks; rules open up for auctioning a share of the permits in time.[32] Free allocation is expected to be based on subsector benchmarks with ex-post adjustments for changes in actual production. The inclusion threshold covers entities with annual emissions of ~26,000 tCO_2 in any year over the period 2013–2019.[33] With regard to Monitoring, Reporting, Verification (MRV), there are MRV guidelines, supplementary data sheets, verification guidelines, and other guidance available for the eight sectors expected to be covered by the ETS.[34] Annual reporting of emissions is to be submitted within a given timeline; 'covered entities

[25] The ETS might possibly move to a cap at a later stage. Intensity-based trade is also referred to as Tradable Performance Standard (TPS) see: L.H. Goulder, X.L Long, J.Y Lu, and R.D. Morgenstern 2020, Working paper: China's Unconventional Nationwide CO2 Emissions Trading System: Cost-Effectiveness and Distributional Impacts, RFF_WP_20-02.pdf

[26] H. Slater, D. De Boer, G. Qian, W. Shu, 2020. *2020 China Carbon Pricing Survey*, December, China Carbon Forum, Beijing

[27] Formerly by the provincial development and reform commissions (DRCs), until MEE was given responsibility for the ETS.

[28] *Carbon Pulse* 2020. China Pilot Market Prices, China's National ETS, Carbon Pulse (carbon-pulse.com), 17 December

[29] Communication with ETS expert. CN Markets: Pilot market data for week ending May 10, 2019 « Carbon Pulse (carbon-pulse.com)

[30] MEP (2018). China to establish ministry of ecological environment, Ministry of Environemntal Protection,(14 March) http://english.mep.gov.cn/News_service/media_news/201803/t20180314_432393.shtml

[31] IEA (2020*). China's Emissions Trading Scheme, Designing efficient allowance allocation*, https://www.iea.org/reports/chinas-emissions-trading-scheme

[32] S. Reklev, 2021.China adopts ETS trading rules (fn 21 infra) .

[33] International Carbon Action Partnership (ICAP): ETS Map (icapcarbonaction.com)

[34] International Carbon Action Partnership (ICAP) – ETS Map (icapcarbonaction.com)

are required to submit the previous year's emissions reports by the end of March each year and shall be responsible for the authenticity, completeness, and accuracy of the reports',[35] and emissions must be verified by a third-party verifier.

Regional developments and collaboration

In 2016 Japan, South Korea and China initiated academic exchanges on linking their emissions trading systems together in the future (World Bank 2016).[36] They discussed establishing a 'North East Asia Carbon Market'. Meetings between experts have been held, for exchange of information and updates, such as carbon pricing dialogues, but without resulting in specific projects.[37]

Japan[38]

Status of carbon markets

Japan has no national market, but two linked local systems: the Tokyo ETS begun in 2010, and Saitama ETS started in 2011. They cover 20% and 18% of their jurisdictions' emissions respectively (which means 12,96 $MtCO_2$ and 6,588 $MtCO_2$ in 2017[39]). The price of carbon was around 5.5 USD in 2019 in the Tokyo ETS.[40] In addition, Japan runs the *Advanced technologies promotion Subsidy Scheme with Emissions Reduction Target*,[41] which is a voluntary cap-and-trade system where enrolled businesses aim to achieve set emissions reductions through proposed new technologies.[42]

Domestic political structures, organization and interests

As for the two local schemes, the Tokyo ETS is run by the Tokyo Metropolitan Government, and the Saitama ETS by the Saitama Prefectural Government.

Japan introduced the *Global Warming Countermeasure Tax* in April 2012.[43] In recent years there have been committees and discussions on Japan's 'long-term low-carbon vision', and carbon-pricing mechanisms have been part of these discussions. The Ministry of Environment are still in discussions with stakeholders.[44] To our knowledge, the Ministry of Economy, Trade and Industry (METI) and Keidanren (the Japan Business Federation) strongly oppose a national market.[45] In October 2021 Prime Minister Yoshihide Suga announced carbon neutrality by 2050;[46] this means that Japan will need to find ways to curb its emissions.

Carbon-market designs

Both Tokyo and Saitama are cap-and-trade systems that cover CO_2. Both carbon markets have the same baseline allocation formula[47] for each of the three compliance phases to date (2010–2014, 2015–2019, 2020–2024). Both schemes cover the energy consumption of buildings and factories. As of 2019, the Tokyo ETS included 1,123 facilities: 954 buildings and 169 factories. In 2017, the Saitama ETS covered 580 facilities: 169 buildings and 411 factories. The entry threshold in both schemes is annual energy consumption of equivalent to at least 1,500kL of crude oil. The two local schemes have been linked since the Saitama ETS began operation. Credits from

[35] International Carbon Action Partnership (ICAP): China publishes two major policy drafts for national ETS (icapcarbonaction.com)
[36] World Bank 2016. Exploring East Asian Cooperation on Carbon Markets
[37] www.iea.org/events/iea-icap-kas-carbon-pricing-dialogue-mitigation-strategies-and-carbon-pricing-in-the-asia-pacific
[38] Based on M. Iguchi 2018. Tokyo's Emissions Trading System: Japan's First Mandatory Cap-and-Trade Scheme, Ch. 6 in J. Wettestad, L.H. Gulbrandsen *The Evolution of Carbon Markets: Design and Diffusion*, London: Routledge,
[39] Authors' calculations based on information available at https://icapcarbonaction.com/en/
[40] https://icapcarbonaction.com/en/ Saitama price not yet available.
[41] www.asset.go.jp/ in Japanese
[42] ICAP 2021 Japan 7 January https://icapcarbonaction.com/en/?option=com_etsmap&task=export&systems%5B%5D=69&sections%5B%5D=27&sections%5B%5D=37&sections%5B%5D=5&sections%5B%5D=6&sections%5B%5D=7&format=pdf&layout=compare
[43] https://doi.org/10.1007/978-981-15-6964-7 p.8
[44] https://icapcarbonaction.com/en/?option=com_etsmap&task=export&systems%5B%5D=69&sections%5B%5D=27&sections%5B%5D=37&sections%5B%5D=5&sections%5B%5D=6&sections%5B%5D=7&format=pdf&layout=compare
[45] Notes from conversation with Stian Reklev, Carbon Pulse, 18 November 2020.
[46] www.theguardian.com/world/2020/oct/26/japan-will-become-carbon-neutral-by-2050-pm-pledges
[47] Base-year emissions x (1 – compliance factor) x compliance period (5 years) https://icapcarbonaction.com/en/

one scheme may be used in the other, but transfers have been modest thus far. Both systems also allow other types of domestic offsets.[48]

Regional developments and collaboration; existing linking discussion/strategies

Since 2016, Japan has participated in dialogues with China and South Korea regarding a North East Asian carbon market,[49] although this does not seem likely to result in an imminent arrangement. Further, Japan has created a Joint Crediting Mechanism (JCM) which through 'diffusion of low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions in developing countries'[50] contributes to Japan's GHG mitigation. The JCM includes bilateral agreements with 17 countries (Bangladesh, Cambodia, Chile, Costa Rica, Ethiopia, Indonesia, Kenya, Lao PDR, Maldives, Mexico, Mongolia, Myanmar, Palau, the Philippines, Saudi Arabia, Thailand, Vietnam).[51]

South Korea[52]

Status of carbon market

When the South Korean ETS started operating in 2015, it was the first East Asian national ETS and the second largest ETS in the world (after the EU ETS). The total number of allowances in 2020 was 548 $MtCO_2$. This cap is based on a BaU forecast. The overall cap is broken down into *sectoral caps* – one of several features unique to the South Korean ETS. Three phases have been decided so far, the first two running for three years and the third for five years: 2015–17, 2018–20 and 2021–25. The initial economy-wide ambition level was to reduce GHG emissions by 30% below the BaU scenario by 2020. However, South Korea's Nationally Determined Contribution (NDC) to the Paris Agreement set a 37% reduction target below the BaU scenario by 2030, which was considered as the guiding target also for the GHG ETS. In December 2020, the NDC was updated, with a target of 24.4% reductions by 2030 against a 2017 baseline.

A key indicator as to performance and functioning is the development of the carbon price. In the course of 2016 and 2017, the South Korean allowance price rose to the highest of all GHG ETS globally at time, apparently due to the very low degree of trading and market liquidity. In early 2015 when the ETS started, the allowance price was just above 7,800 Korean Won (KRW) (approx. EUR 6.30); it remained unchanged until June 2016, when it doubled. After a continued slow but steady increase in the second half of 2016, the allowance price peaked in February 2017 at 26,500 KRW (approx. EUR 21.25), gradually falling to approx. 20,000 KRW (or EUR 16.70) in April 2016. The trading volume for the entire year 2015 was zero; it remained low throughout 2016, picking up slightly in 2017. The government intervened in both 2016 and 2017, releasing more allowances into the market. In 2019 South Korea's ETS emissions fell for the first time, driven by cuts in the power sector and leaving the market marginally over-supplied. The price has also had a moderate development, hovering around 25,000 KRW (approx. EUR 21), not very different from EU ETS prices at this point in time. However, in 2020 prices rose to above 40,000 KRW, but fell 50% over the summer as government data showed that the market was oversupplied.

Political structures, organization and interests

In 2012, a large cross-party majority in the South Korean Parliament voted in favour of the ETS Act. President Lee Myung-bak strongly supported its adoption. However, the Act was not uncontroversial: fierce resistance came from the Ministry of Knowledge Economy (in 2013, renamed the Ministry of Trade, Industry and Energy) and from business groups. Main criticisms concerned increased costs and loss of international competitiveness. Despite this opposition, the GHG ETS was adopted, but some concessions were made – most importantly, the start was postponed from 2013 to January 2015. The South Korean industry structure is quite unique, with a few large conglomerations dominating the economy. Those large companies are influential

[48] https://icapcarbonaction.com/en/ets-map
[49] World Bank 2016. Exploring East Asian Cooperation on Carbon Markets
[50] https://gec.jp/jcm/about/
[51] International Carbon Action Partnership (ICAP): ETS Map (icapcarbonaction.com) https://icapcarbonaction.com/en/ets-map

[52] This is largely based on K. Biedenkopf and J. Wettestad, South Korea: East Asian pioneer learning from the EU, in Wettestad and Gulbrandsen (2018), *The Evolution of Carbon Markets: Design and Diffusion*, London: Routledge, 145–166.

players also in policymaking, as their significant contribution to the country's GDP makes them crucial to national economic growth. This power became evident when industry voiced its firm resistance to the GHG ETS. To get the ETS adopted, the government had to invest considerable effort in convincing industry, and also made several concessions—most notably, ensuring free allocation in the first trading phase and postponing system start from 2013 to 2015. Key governmental bodies here are the Ministry of Strategy and Finance and Ministry of Environment (with the latter now in charge of the ETS). Concerning price intervention, the central body is the Emissions Allowance Allocation Committee.

Carbon market design

The system has a *comparatively quite comprehensive scope* that includes a wide range of sectors and GHGs: power; heavy industry; domestic aviation; buildings; and waste; and six GHGs: CO_2, CH_4, N_2O, PFCs, HFCs, SF_6. The system covers approximately 610 large emitter companies in the power sector and several energy-intensive industry sectors. During the first trading phase, allowances were allocated for free, with the phasing-in of auctioning of 3% of the allowances planned for the second phase, and 10% in the third phase. An additional special design feature is *the possibility of direct governmental intervention* in the system. As noted, an Allocation Committee (under the Ministry of Strategy and Finance) may decide to implement market stabilization measures as in cases where the market allowance price of six consecutive months is at least three times higher than the average price of the two previous years. Rules for offsets specify maximum 10% offsets and only domestic ones, with qualitative restrictions; no international credits in phase 1 (2015–2017; max. 5% in phase 2, 2018–2020).[53]

Regional developments and collaboration

As noted, in 2016 Japan, South Korea and China initiated talks on linking their emissions trading systems together in the future,[54] and discussed establishing a 'North East Asia Carbon Market'. Meetings have been held in recent years, largely among experts.

Kazakhstan[55]

Status of carbon market

Kazakhstan was the first Central Asian country to implement an economy-wide ETS when it began in January 2013. The size of the ETS was 162 $MtCO_2$ in 2020[56], roughly the same as the Shanghai ETS pilot in China, and covers half of Kazakhstan's carbon emissions. It has so far operated in three phases 2013, 2014–15, and 2018–2020. The two-year gap 2016–17 was put in place in order to deal with technical and regulatory challenges. However, companies had to continue reporting emissions, and MRV procedures were retained, also during the pause. The 'Environmental Code'[57], together with the 'National Allocation Plan'[58] are key political documents regulating the market today. The ETS currently covers 129 companies and a total of 225 installations, with a carbon price around 1.14 USD per ton CO_2 (2019 average). However, the future of the Kazakh market is uncertain.[59]

Domestic political structures, organization and interests

The foundations of Kazakh ETS can be traced back to 2007, when the 'Environmental Code' was adopted. It required industrial and energy companies to make GHG inventories and report them annually. The 2009 *Zhasyl Damu* (Green Growth) industrial programme promoted emissions reductions, paving the way for the amendment of the Environmental Code in 2011, which included specifications of ETS fea-

[53] In phase 3 (2021–2025) offsets will continue to be allowed in limited fashion. Further rules and conditions have yet to be released. International Carbon Action Partnership (ICAP): ETS Map (icapcarbonaction.com)

[54] World Bank 2016.

[55] This is largely based on F. Sammut, L.H. Gulbrandsen and J. Wettestad, Emissions 2018. Trading in Kazakhstan: Complex Application of the 'EU Model', Ch.10 in J. Wettestad and L.H. Gulbrandsen, *The Evolution of Carbon Markets: Design and Diffusion*, London: Routledge,

[56] The cap for the three years 2018–2020 was 485.9 MtCO2 (162 MtCO2 is the annual average)

[57] http://zan.gov.kz/client/#!/doc/31308/rus (in Russian)

[58] http://zan.gov.kz/client/#!/doc/117046/rus (in Russian)

[59] https://climateactiontracker.org/countries/kazakhstan/

tures.[60] The Ministry of Energy, Ministry of Ecology, Geology and Natural Resources as well as JSC Zhasyl Damu, a state-owned joint stock company, are involved in running the ETS. The Caspian Commodity Exchange JSC is the trading platform. It seems the enrolled companies also are influential in the policy process. The 2016/2017 operational hiatus came because industry had voiced discontent over the rules.[61]

Carbon market design

The Kazakh ETS is a free-allocation cap-and-trade system which covers CO_2. Allocations began in the first year with companies receiving 100% of their reported needed allowances, but have since been gradually reduced.[62] In the first two phases, allocation followed 'grandparenting' principles, but for the third period from 2018, companies could choose between grandparenting or product-based benchmarking.[63] The following sectors are included: energy (electricity and heat production) industry (non-ferrous metals (aluminium, zinc, copper), ferro-alloys, iron and steel and cement, coal mining, oil and gas extraction. The entry threshold for facilities is emissions higher than 20,000 tons of CO_2 annually. The system permits domestic offsets.

Regional developments and collaboration; linking discussion/strategies

The ETS was formed with linking in mind (especially the EU ETS),[64] as a geographically close market, and as the longest running market to date. To our knowledge there are no current plans or discussions on linking with other markets; indeed, it is uncertain whether the ETS will continue after 2021[65]

Other Asia-Pacific developments

In the Asia-Pacific region, there are also other markets that are running, planned or have been shelved. The Australian Carbon Pricing Mechanism ran from 2012 to 2014; in New Zealand an ETS has been operating since 2008. Previously an intensity-based system, the New Zealand ETS will from the 2021–2025 phase have an emissions cap.[66] More countries are laying the foundations for future carbon markets. Indonesia has created an online platform for reporting industry GHG emissions; has conducted MRV pilots and passed preparatory legislation for a future scheme. In the Philippines, a bill that approved an ETS was proposed and conditionally approved in February 2020, but to our knowledge it has not yet been passed. Not only CO_2 would be covered, but also methane, nitrous oxide and hydrofluorocarbons. In Thailand, the 'national Reform Plan' from 2018 requires the government to adopt an economic instrument for curbing GHG emissions, and MRV pilots have already been conducted for several industrial sectors.[67] Also in Vietnam, preparations have been made, such as planning to build an MRV system, and in December 2020 the National Assembly approved a revision of the environmental law that included provisions for a domestic ETS.[68] Further, Asian countries as diverse as India, Indonesia Thailand and Vietnam, have signed agreements with Japan's JCM.

[60] Sammut et al., 2018 (fn 54 infra) pp.168–169
[61] Kazakhstan suspends ETS until 2018 – Minister https://carbon-pulse.com/16179/
[62] Sammut et al., 2018(fn 54 infra) p.169
[63] https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems%5B%5D=46 p.2
[64] Sammut et al. ,2018 (fn 54 infra), p.177
[65] https://climateactiontracker.org/countries/kazakhstan/
[66] https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=48
[67] Data from International Carbon Action Partnership (ICAP): ETS Map (icapcarbonaction.com) https://icapcarbonaction.com/en/ets-map
[68] S. Reklev, 2020. Vietnam legislates domestic emissions trading scheme, *Carbon Pulse* 19 November (carbon-pulse.com); https://icapcarbonaction.com/en/ets-map

4. Key opportunities and challenges for linking Asian carbon markets

With the literature and lessons summed up in section 2 as a backdrop, in this section we examine experiences in linking between the countries in focus here, and assess central prospects ahead. Experts have recognized the potential benefits of linking carbon markets, but much remains to be done before a North East Asia Carbon Market might be established. The topic received considerable attention in 2016/2017, with seminars and conferences; a few reports on the potential for linking in Northeast Asian markets were published in 2016–2018.[69] These were optimistic and concluded that China, Japan and South Korea are well placed to lead in cooperative climate response efforts. However, these reports also noted that linkage considerations are complex, multi-layered, and have implications across sectors and jurisdictions – much in line with the evidence and lessons we summed up in section 2.

Key lessons learnt from international and regional linking experience

One development which can be interpreted as supporting the prospects for linked carbon markets is the worldwide trend for more and more countries to express interest in employing market mechanisms to control GHG emissions. There are ongoing technical and judicial preparations among several Asian countries, as mentioned above. In the first round of the Intended Nationally Determined Contributions (INDCs) reported to UNFCCC member-states as diverse as Belize, Iran, Malaysia, Mexico, Russia, Sierra Leone and Turkey all mention market instruments and mechanisms as the way forward.[70]

Moreover, there are outstanding issues pertaining to the implementation of Article 6 of the Paris Agreement. If the rules for Article 6 are agreed upon at COP 26 Glasgow 2021, it may enable a move towards linking carbon markets.[71] In particular, Article 6.2 provides for an accounting framework for international cooperation, such as linking the emissions-trading schemes of two or more countries.[72] It also allows for the international transfer of carbon credits between countries. Japan, South Korea and China all have carbon-neutrality goals (of 2050, 2050 and 2060 respectively), which may provide an incentive to explore the possibilities of linking carbon markets.

Let us return to the Asian cases and experience, in light of the lessons discussed in part 2:

Linking is complex and tends to take time.

This has been the case for most linkages established thus far, and is also what we see as realistic for a potential East Asian market. China, Japan and Korea now have variations of carbon markets at the national or subnational level, but there are major differences in policy design and implementation status. For example, only Korea has experience with the operation of a nationwide ETS. Even in 2017, the year which saw most positivity and activities as regards East Asian linking, one of China's foremost experts in the ETS stated that linking to other carbon markets in the region would not take place before

[69] ADB 2016. *Emissions Trading Schemes and Their Linking: Challenges and Opportunities in Asia and the Pacific* (adb.org); J. Ewing, 2016. 'Roadmap to a Northeast Asian Carbon Market. Asia Society Policy Institute*, September*; J. Ewing, 2018, *Carbon Market Cooperation in Northeast Asia: Assessing Challenges and Overcoming Barriers* FULL REPORT: Carbon Market Cooperation in Northeast Asia.pdf (asiasociety.org)

[70] Searched via INDC portal: www4.unfccc.int/sites/submissions/indc/Submission%20Pages/submissions.aspx

[71] Carbon Brief 2019. In-depth Q&A: How 'Article 6' carbon markets could 'make or break' the Paris Agreement | Carbon Brief

[72] What You Need to Know About Article 6 of the Paris Agreement | World Resources Institute (wri.org)

2030.[73] In order to link carbon markets, intense exchange and learning between the countries would be necessary. Not much has happened since then, apart from dialogue meetings to exchange information. Further, getting the national Chinese ETS fully operational is clearly a necessary and central prerequisite (although not the only one). The lack of a national Japanese market may also prove challenging.

Carbon pricing and linking of such systems have distributional (power) implications and disadvantaged actors may mobilize in opposition

Emissions have been increasing significantly in the region, especially in China. China, Japan and South Korea together stood for roughly 34.7% of the world's emissions in 2018 – 29.7%, 3.2% and 1.8% respectively[74] – there is no denying the unbalanced distribution of general economic power and related emissions and, consequently, market shares. The sheer size of China, its 1.4 billion population, and being the world's second largest economy, all make the relationship among the three countries uneven. Globally, however, both Japan and South Korea rank higher in per capita GDP – USD 40 247 and USD 31 762 (ranked 24th and 29th respectively) – as against China's USD 10 262 (ranked 64th).[75]

China and South Korea have national ETS schemes, but there are strong actors in Japan opposed to a national market, including METI (the Ministry of Economy, Trade and Industry) and Keidanren (the Japanese Business Association). Japan also has a carbon tax in effect. Further, its Joint Crediting Mechanism (JCM) with 17 bilateral agreements, may already offer some of the benefits an East Asian market could have provided, but with Japan retaining more control. Despite the Japanese participation in tripartite linking talks, the likelihood of Japan's engaging in a tripartite Northeast Asian carbon market seems low; Tokyo and Saitama appear to be the current candidates for potential regional linkage. Also in South Korea there has been some industrial opposition to the allocation processes.

Successful linking has been regional and within broader cooperative umbrellas

As the best examples of linking are regional, such as California–Quebec within the WCI and EU and Norway within the EEA, this may indicate a positive future for an East Asian Market. Should China, Japan and South Korea manage to build and complete a linked market, it would be the world's largest – indeed, *the* market to reckon with, carrying strong symbolic importance.

In addition, there are regional economic cooperation fora such as Asia-Pacific Economic Cooperation (APEC) and Central Asia Regional Economic Cooperation (CAREC) that might possibly form some sort of broader cooperative umbrella for carbon-market linking efforts. This is an interesting question to be further explored in future research.

Starting with 'compatible' designs and openness to stepwise linking make progress likely

Do the design and functioning of the system so far include elements which might represent challenges/impediments to possible future linking efforts? As noted in the theory section, compatibility in the level of ambition, the rules determining offset use, and the design of price/supply management mechanisms have been identified as essential. In the Korean ETS, the possibility of direct governmental intervention may prove challenging if other countries do not have similar arrangements (see Vivid Economics study 2020; CP 22/6 2020). China has somewhat similar possibilities of direct governmental intervention. On the other hand, this feature means a guarantee against dramatic price volatility. Also the inclusion of 'indirect' emissions may differ from the approach chosen by others, giving rise to accounting and MRV challenges. Again, the Korean and Chinese markets may not be so different in this regard.

[73] S. Reklev 2017. COP23: ETS links slink back on Asia Pacific countries' priority list, 13 November, *Carbon Pulse* (carbon-pulse.com)

[74] M. Crippa, G. Oreggioni, D. Guizzardi, M. Muntean, E.Schaaf, E. Lo Vullo, E. Solazzo, et al. 2019. *Fossil CO2 and GHG emissions of all world countries: 2019 Report*, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-11100-9, doi:10.2760/687800, JRC117610.

[75] Climate Change Country Profile Compare | Climate Watch Data

Despite the general geopolitical tensions among these countries, what China, Japan and South Korea do have in common is a carbon-neutrality goal – by 2060, 2050 and 2050 respectively. Japan is one of China's top trading partners. Linking enablers could include common climate-change goals and ambitions on climate-change mitigation action, existing and close trading relationships; moreover, there is the political foresight and will to link. The national mitigation targets represent an important political foundation for setting the accepted stringency of caps among systems, which can be seen as a prerequisite for linking.

There is also collaboration between environmental ministers of Japan, Korea and China, who meet regularly through the Tripartite Environment Ministers Meeting.[76] Although the carbon market was not a topic at the 2019 meeting, the three countries exchanged news on the latest developments in their environmental policies. The established political will concerning environmental issues could prove relevant to carbon-market cooperation. However, it should also be noted that China expressed in 2017/2018 that it was not considering linking its ETS with other countries at that point (Li Gao, then at NDRC).[77] Experts from China, South Korea, and Japan are currently investigating the potential for ETS linkages among these countries, and have met for exchange of experience with their respective carbon markets. There has been some interest in considering the future possibility of linking when designing the system, but experts have stated it is not a short-term issue (not before 2030). The main stumbling blocks for ETS links concern political will, technical challenges, harmonization challenges and national coordination with other policies and targets.[78]

Preparations are also being made at the domestic level. South Korea's Act on Allocation and Trade of the GHG Emissions Allowances and Enforcement Decree specifies that the ETS will link with carbon markets in other countries – provided they are considered compatible, and with credible monitoring, reporting, and verification (MRV) based on the requirements of the United Nations Framework Convention on Climate Change (UNFCCC). China has also shown interest in exploring the possibility of linking with the international carbon market. Chinese leaders have stated that once China establishes a nationwide carbon-trading system, it would be willing to collaborate with other countries and develop harmonized rules for linking. China has included linking among its ETS design priorities under the World Bank's Partnership for Market Readiness programme, and has conducted a review of case countries, including Korea, in several areas of ETS: design, the power- sector participation and risk management and allowance adjustment mechanisms for power-sector participation in the national ETS, allocation methods, pricing mechanism.[79] Although it may not be ready to link with other national carbon markets before the national ETS is mature, it is clear that Beijing has shown interest in this area. Chinese Certified Emissions Reductions (CCERs) included in the draft ETS regulations could offer a potential for cooperation between China and Korea.[80] South Korea now allows foreign offsets, but with strict rules that the projects must be majority-owned by a Korean company (and that ownership must have been there from the outset: Koreans may not buy existing offset projects). And projects must go through the Clean Development Mechanism (CDM). One example of cooperation between China and Korea concerns a CDM project for generating carbon credits which could eventually be eligible for compliance use in the South Korean emissions trading scheme.[81]

[76] Joint Communiqué,21st Tripartite Environment Ministers Meeting among Japan, Korea and China 23–24 November 2019, Kitakyushu, Japan (npis.jp)
[77] *Carbon Brief* 2018. Q&A: How will China's new carbon trading scheme work? | Carbon Brief
[78] S.Reklev, 2017 (fn 71 infra)
[79] World Bank 2018. China PMR Project Implementation Status Report.pdf (thepmr.org)
[80] Based on communication with Stian Reklev, Carbon Pulse, 18 November,2020.
[81] The project is estimated to generate some 200,000 Certified Emissions Reductions (CERs) annually. South Korean firm strikes rare China CDM deal « Carbon Pulse (carbon-pulse.com)

Table 1: Summary of Reduction Targets and Trading System by Country

Country	System coverage	Level of ambition	Target type & coverage	Status	Start date
China	National	Reduce carbon intensity of its GDP 40–45% below 2006 by 2020 and 65% by 2030; peak CO2 emissions before 2030, carbon-neutral by 2060	Carbon intensity; CO_2	Launched 2017	Trading in power sector from 2021
China	Beijing	Carbon intensity target 2016–2020: 20.5%	Carbon intensity; CO_2	Operational	2013
China	Chongqing	2016–2020: 19.5%	Carbon intensity CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	Operational	2014
China	Guangdong	2016–2020: 20.5%	Carbon intensity, CO_2	Operational	2013
China	Hubei	2016–2020: 19.5%	Carbon intensity; CO_2	Operational	2014
China	Shanghai	2016–2020: 20.5%	Carbon intensity; CO_2	Operational	2013
China	Shenzhen	By 2020: 50% from 2005	Carbon intensity; CO_2	Operational	2013
China	Tianjin	2016–2020: 20.5%	Carbon intensity; CO_2	Operational	2013
China	Fujian	2016–2020 19.5%	Carbon intensity	Operational	2016
Japan	Tokyo	25% below 2000 by 2020	Absolute; CO_2	Operational	2010
Japan	Saitama	21% below 2005 by 2020	Absolute; CO_2	Operational	2011
Kazakhstan	National ETS	Reduce GHG emissions 7% below 1990 by 2022, and by 15% by 2030	Absolute; CO_2	Operational	2013
South Korea	National	Reduce GHG emissions 30% below BAU by 2020 and 37% below BAU by 2030	Absolute; CO2, CH4, N2O, PFCs, HFCs, SF6.	Operational	2015

5. Summing up key findings and reflections

The report has provided an overview of the status of carbon markets in key economies in Asia, with main emphasis on China, South Korea and Japan. In the following we sum up our key findings and reflections.

Paris Agreement setting the stage

Countries are increasingly showing interest in employing market mechanisms to control GHG emissions. From a global framework perspective, the upcoming COP26 in Glasgow 2021 may contribute to setting the stage for international carbon trading. With the COP growing close, attention is increasing towards mitigation strategies and carbon pricing in the Asia-Pacific.[82] The rules of Article 6 of the Paris Agreement (if agreed upon at COP 26 Glasgow 2021) may enable a move towards linking carbon markets. Article 6.2 in particular provides an accounting framework for international cooperation, such as linking the emissions-trading schemes of two or more countries. It also allows for the international transfer of carbon credits between countries. If Article 6.2 rules are approved at Glasgow 2021, they will provide an opportunity for China, Japan and Korea to take full advantage of the international cooperation scheme of the Paris Agreement. However, the potential success of linking carbon markets will depend on several aspects in addition to the Paris Agreement as such.

Asian carbon markets, opportunities, and differences

We can note positive trends and opportunities for linking between carbon markets in North East Asia. Already, there is quite strong cooperation, not least in trade, among the three focal countries. They also share several environmental challenges. Importantly, there is common goal of achieving carbon neutrality (by 2050 for Japan and South Korea, and 2060 for China), which could provide an incentive to collaborate in using market mechanisms/carbon pricing to address emissions in the region.

As noted in section 4 above, compatibility in the level of ambition, the rules determining offset use, and the design of price/supply management mechanisms are essential for linking carbon markets. One factor that may pull in a positive direction is that China, South Korea and Japan already have various types of carbon markets at the national or sub-national level. However, considerable differences remain in policy design and implementation status: the carbon markets differ in size, structures, design, and the markets are at different stages of development. Thus, numerous factors present challenges to achieving a linked market. China has recently issued new guidelines and will begin actual trading in the power sector in 2021. South Korea has operated a national market since 2015. In Japan, important actors are opposed to a national market. China's ETS is a CO_2 intensity-trade scheme, whereas both Japan and South Korea have absolute caps (cap-and-trade, see Table 1). All markets cover CO_2.

A good foundation for possible linking between markets is the fact that all three countries have expressed interest in discussing linking their carbon markets. In 2016 Japan, South Korea and China initiated talks on how to link their emissions trading systems together in the future,[83] and discussed establishing a 'North East Asia Carbon Market'. Meetings between experts have been held in recent years, for exchange of information and updates, although without resulting in much specific cooperation. The three still hold annual meetings on linking carbon markets, but this is mostly a matter

[82] IEA–ICAP–KAS Carbon Pricing Dialogue: Mitigation strategies and carbon pricing in the Asia-Pacific. Event - IEA

[83] World Bank 2016. Exploring East Asian Cooperation on Carbon Markets (worldbank.org)

of academics exchanging experiences, with governments merely serving as facilitators.[84]

We conclude that an ETS linking between Korea and China appears more feasible, given the many similarities between the national schemes, even though the Korean market is much smaller than China's and would be vulnerable to price fluctuations. As Japan is also actively pursuing its JCM which covers bilateral arrangements, a tripartite East Asian market link does not appear to be the top priority for international offsetting of Japanese emissions. Whether a successful linking of the Chinese and South Korean markets would make it more desirable for Japan to join remains to be seen: there are pros and cons to joining forces and to standing alone.

The inclusion of 'indirect' emissions may be different from the approach chosen by others, with such emissions raising special accounting and MRV challenges. Also here we see a relevant topic for further research. There are some regional (economic) fora which might function as 'umbrellas' for carbon-market linking: for instance, APEC and CAREC could perhaps form a broader cooperative umbrella for efforts at carbon-market linking. The Western Climate Initiative (WCI) is an example to investigate, involving California, and the Canadian provinces of Québec and Nova Scotia.

However, all previous experience indicates that linking takes time. That should not discourage potential explorations to examine the possibilities. Stepwise linking could make sense, building on the cooperative efforts and systems already established. One possible linkage could be the CCERs (Chinese Certified Emissions Reductions), to be included in China's ETS from day one. Both China and South Korea include offsetting in their systems, and there are opportunities for building on the current cooperation between the two.

Future research

This review has highlighted the need for a deeper understanding of several aspects of carbon-market linkage. Establishing a North East Asian regional carbon market hub could have economic, environmental, and strategic benefits. However, further study is needed of how to resolve the challenges involved in linking differently structured, designed and functioning markets.

Politics and political will are important factors in successful linking. Here it must be borne in mind that carbon-market linking takes place in a context of geopolitical tensions, so the prospects must be viewed in the broader cooperative context. With the Glasgow COP planned for late 2021, and the potential for agreement on the implementing rules for Article 6 of the Paris Agreement, the time is ripe for an international research project involving experts from China, Japan and South Korea to analyse recent developments and identify concrete actions to enable linked carbon markets in northern Asia.

[84] Communication with Stian Reklev, Carbon Pulse, 18 November 2020.

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