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

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SUMMARY

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

INTRODUCTION

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

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

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

Linking carbon pricing systems could generate economic benefits for GHG reduction in multiple ways (Anger, 2008; Ewing, 2016), including the following three aspects: (1) efficiency gains, (2) liquidity

gains, and(3) distributional impacts. In 2015, the Energy and Climate Change Committee (ECCC) of the United Kingdom (UK) Parliament recommended that a future international climate framework promoting the use of carbon markets and facilitating linking ETSs would be the most cost-effective way to reduce GHGs (ECCC, 2015).

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

CHINA'S ETS DEVELOPMENT

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

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

PROPOSED LINKAGE-READINESS DESIGN FRAMEWORK

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

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

TABLE 8.1. KEY MILESTONES OF CHINA'S ETS DEVELOPMENT

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

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

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

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

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

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

Setting an Emissions Cap

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

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

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

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

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

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

Industry and GHG Coverage

The ETS coverage, including industry coverage, emissions coverage, and participation threshold, determines the entities covered for compliance purposes in the carbon market. Misalignment in ETS coverage when

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

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

Consistent Regulation Point and Accounting of Emissions

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

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

Allocation Methods

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

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

Flexibility Mechanisms

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

Measurement, Reporting, and Verification (MRV)

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

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Registry and Enforcement

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

Legal, Regulatory, and Policy Environment

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

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

CONCLUSION

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

ENDNOTES

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

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

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

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

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

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

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