

Key issues in designing China's national carbon emissions trading system

MAOSHENG DUAN^{a,b} and LI ZHOU^b

ABSTRACT

The design of China's national carbon emissions trading system (ETS) has been shaped by major considerations including the significant disparities that exist between the different regions of the country, concerns about possible impacts of the ETS on the economy, the continuously evolving policy environment, and the need to divide responsibilities appropriately among relevant authorities. To address these issues and other policy constraints while adhering to the principles of high efficiency and effectiveness within a national system of unified rules, China created a legal framework with unique rules for the coverage and scope of emissions trading, allocations, cap setting, monitoring, reporting and verification, compliance, and division of responsibilities. The system was designed to maintain unified rules across the entire system while also providing flexibility in aspects ranging from coverage and scope, allocation and cap setting to compliance. This design will not only facilitate the formulation of a State Council regulation providing the necessary strong legal foundation for the ETS but will also avoid the frequent changes of regulations that often occur in an evolving policy environment.

Keywords: China, carbon, emissions trading, national, design

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✎ 1. INTRODUCTION ✎

China has committed to lower the carbon dioxide emissions intensity of its GDP by 40–45% and 60–65% by 2020 and 2030, respectively, from 2005 levels. To achieve these mitigation targets, China could have chosen to continue its decades-long tradition of relying solely on command-and-control policies, such as the Energy-Saving and Low Carbon Action for 10,000 Enterprises Program implemented during the Twelfth Five-Year Plan (2011–2015) period, or to use more market-based approaches, such as carbon emissions trading. Having experienced the significant negative impacts and high cost of command-and-control policies on energy conservation (Yang 2011; Jiang 2011), China has decided to make a significant shift in its policy choices by giving the market the “decisive” role in allocating resources. The Chinese government considers greenhouse gas (GHG) emissions a type of natural resource, so carbon emissions trading is expected to play an increasingly important role as a market approach in the achievement of established GHG mitigation targets.

As the most populous country in the world with more than 30 provincial-level regions at very different stages of development, China has adhered to a policy tradition of “crossing the river by feeling the stones” in its opening-up and reform process since the late 1970s (Zhang

^a Corresponding author: duanmsh@tsinghua.edu.cn, +86 10 6277 2596.

^b China Carbon Market Research Center, Energy Science Building, Tsinghua University, Beijing Shi, China.

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and Chang 2016). For major policies that have been implemented nationwide, in most cases there has been a pilot phase to test the applicability of the proposed policy designs in selected regions and improve the designs accordingly. The carbon emissions trading system (ETS) is the first major market-based approach that has been utilized in China to control GHG emissions. To gain first-hand experience with the design and operation of the ETS, the Chinese government decided in 2011 to implement the policy in seven selected regions, including two provinces (Guangdong and Hubei) and five municipalities (Beijing, Tianjin, Shanghai, Chongqing, and Shenzhen).¹ The seven pilot systems differ in many respects, as presented in Table 1, which reflect the divergent situations of the seven regions.

It was clear to the Chinese government when it decided to test ETS in the selected regions that the pilot systems would be the country's first step toward utilizing market approaches to control its GHG emissions and that the final target would be to establish a national system. After three to four full compliance years of the pilot systems, China has gained abundant information and experience with designing, operating, and improving the ETS, paving the way toward designing and launching a national system (Zhang et al. 2014; Jiang et al. 2014; Wu et al. 2014; Qi et al. 2014).

China will start its national system in 2017 as planned.² Until June 2017, the main legal basis for China's national ETS had been the Interim Management Measures on Carbon Emissions Trading (hereafter Interim Measures), a ministry-level decree issued by the National Development and Reform Commission (NDRC), China's national authority on both economic and climate issues (NDRC 2014). Clear provisions are contained in the Interim Measures regarding the basic framework of China's national system, including a roadmap and basic rules for developing the system (Duan 2015), but all detailed rules at the operational level will be elaborated further at a later stage. Although some provisions for administrative licensing, such as eligibility requirements for third-party verifiers or financial penalties to enforce compliance, are necessary for the effective operation of the national system, they cannot be established by ministry-level decree but only by laws or regulations.³ To address this challenge, the Regulation on National Carbon Emissions Trading (draft version) was developed by the NDRC and submitted to the State Council in December 2015 in an effort to establish a more solid legal basis for the system.⁴

Although the basic framework of China's national ETS has already been determined, the process of translating the general principles into implementable provisions has proven to be difficult. There have been divergent views on the design of the national system, even among senior policy makers,⁵ and difficulties balancing the different interests of major stakeholders. A brief summary of the major rules arising in the detailed design of China's national system is given in Table 2, and in the following sections, some of the key issues affecting the development of the detailed rules are analyzed in depth and possible solutions proposed.

1. National Development and Reform Commission, 2011. Notice on the Work of Piloting Carbon Emissions Trading. NDRC, Beijing.

2. United States and China, 2015. US-China Joint Presidential Statement on Climate Change; United States and China, 2016. US-China Climate Change Cooperation Outcomes.

3. The legislation law of the People's Republic of China, 2000 and 2015; Administrative Licensing Law of the People's Republic of China, 2003.

4. National Development and Reform Commission, 2015. Proposed Regulation on National Carbon Emissions Trading. <http://www.ccc.org.cn/d/file/huanbao/huanbaobu/2016-01-25/4e618c8dbbf85814d75c58da92f46465.pdf>.

5. National Development and Reform Commission, 2016. Focused Discussions on Ways to Develop the National Carbon Emissions Trading System. http://qhs.ndrc.gov.cn/gzdt/201612/t20161227_832885.html.

TABLE 1
Seven Pilot Carbon Emissions Trading Systems in China in 2017^a

Pilot	Beijing	Tianjin	Shanghai	Chongqing	Hubei	Guangdong	Shenzhen
Starting date	2013	2013	2013	2014	2014	2013	2013
Gas Covered	CO ₂	CO ₂	CO ₂	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	CO ₂	CO ₂	CO ₂
Industries Covered	Electric power, heat generation, iron, and steel	cement, petrochemicals, chemicals, service exploration of oil and gas	petrochemicals, chemicals, nonferrous metals, building materials, textiles, paper and pulp, building, public transportation	electrolytic aluminium, ferroalloys, calcium carbide, cement, caustic soda	petrochemicals, chemicals, manufacturing, nonferrous metals, building materials, food and beverage, paper and pulp, medicine	cement, petrochemicals, paper and pulp, civil aviation	water supply, manufacturing, buildings, public transportation
Annual emissions threshold (tCO ₂)	5,000	20,000	10,000	20,000	150,000	20,000	3,000
Annual emissions Cap ^b (MtCO ₂)	46	160	155	100	253	386	28
Allocation approaches	Free allocation, auctions	Free allocation	Free allocation, auctions	Free allocation	Free allocation, auctions	Free allocation, auctions	Free allocation, auctions
Offsetting Limit	5% of free allowances	10% of annual emissions	5% of the annual free allowances	8% of annual emissions	10% of annual free allowances	10% of annual emissions	10% of annual emissions
Financial penalty	3–5 times of market value	N/A	50,000–100,000 Chinese Yuan	N/A	Up to 150,000 Chinese Yuan	Up to 50,000 Chinese Yuan	3 times of market value

^a Due to space limit, simplification has been made regarding allocation approaches and emissions threshold. All information in the table is obtained from documents issued by the pilot ETS authorities.

^b The caps in all the pilot systems are established to limit the total allowances to be issued and do not necessarily equal the number of allowances actually issued. Sources: Pilot trading systems.

TABLE 2
Current Status of Major Rules of China's National ETS

Issue	Principles in the <i>Interim Measures</i>	Operational Rules
Uniformity of rules	Same rules will be applied across the system	N/A
Coverage and scope	To be determined by NDRC	CO ₂ Eight sectors, starting with power sector, cement, and electrolytic aluminum at the very beginning Enterprises with annual emissions of more than 26,000 tCO ₂ in any year between 2013–2015
Allocation	Free allocation as the major approaches to be complemented by auctioning	Real production-based benchmarking Detailed technical guidelines are under test use
Emissions cap	Consists of free allowance, allowances for new entrants and market adjustment, and to be determined by NDRC	Cap will be determined mainly through the allocation (i.e., bottom-up approach) with details to be announced
Monitoring, reporting and verification system	Rules to be determined by NDRC	Sectoral guidelines on emissions accounting and reporting Recommended eligibility requirements for verifiers and guidelines for verification
Offsetting	Rules to be determined by NDRC	Technical guidelines under development
Division of responsibilities	Two-level management, with NDRC mainly developing the rules and provincial-level DRCs mainly implementing the rules	Operation guidelines under development

Source: own compilation.

2. REGIONAL DISPARITIES

At the moment, there are 22 provinces, 5 autonomous regions, and 4 municipalities directly under the central government in the mainland of China, and all of them will be covered by China's national ETS in the initial stage. The development levels in these 31 provincial-level regions differ widely in many respects such as economic development and structure, energy structure and consumption, and carbon emissions (He et al. 2016; Cao et al. 2015). Generally, regions in eastern China are the most developed, and those in central China more developed than others in western China. China has established an 18% reduction target for the CO₂ intensity of its economy during the Thirteenth Five-Year Plan period, and this target has been broken down into provincial-level targets (State Council 2016). Table 3 provides a brief overview of significant differences among several selected provincial-level regions.

Whether and how to address the regional disparities in the design of China's national system has been one of the most controversial issues. Western regions have been continuously asking for preferential treatment, stating that they are less developed than those in the middle

TABLE 3
Differences among Selected Provincial-level Regions (2015)^a

Region	GDP (billion Yuan)	Population (million)	GDP per capita (1000 Yuan)	Energy Consumption (Million tce)	GDP Energy Consumption Intensity (tce/million Yuan)	Industrial Structure (Primary: Secondary: Tertiary)	Reduction target for CO ₂ intensity of economy (2016–2020)	Geographical Location
Beijing	2,301	22	105	69	30	0.6:19.6:79.8	20.5%	East
Jiangsu	7,012	80	88	323	46	5.7:45.7:48.6	20.5%	East
Guangdong	7,281	108	67	301	41	4.6:44.6:50.8	20.5%	East
Jilin	1,427	27	53	81	57	11.2:51.4:37.4	18%	Central
Henan	3,701	95	39	232	63	11.4:49.1:39.5	19.5%	Central
Shanxi	1,277	37	35	173	135	6.2:40.8:53.0	18%	Central
Xinjiang	932	24	39	157	168	16.7:38.2:45.1	12%	West
Ningxia	291	7	42	54	186	4.2:57.9:37.9	17%	West
Yunnan	1,372	47	29	104	76	15.0:40.0:45.0	18%	West

^a Sources: Various documents published by national and provincial-level authorities.

and eastern regions and even sometimes referring to the “principle of common but differentiated responsibilities.”

This issue is critical for several reasons. First, it relates directly to the political acceptance of the system design by less developed regions. Second, it is closely connected to the overall design philosophy of the national system, i.e., whether a unified system with unified rules should be established. Third, there have always been concerns about the high risk of a “race to the bottom” if local authorities with the remit to formulate rules are too generous in allowance allocation to enterprises in their own regions to gain a competitive advantage.

NDRC, supported by most experts, has insisted from the beginning that unified rules across all regions would best ensure equity without distorting competitiveness and would provide the highest cost effectiveness of the system. The idea of a national system with unified rules has been the focus of intensive discussion and is embodied in the Interim Measures and the proposed Regulation on National Carbon Emissions Trading.

Regional differences have to be carefully considered in the system’s design to increase its acceptance at the regional political level, and unified rules do not necessarily mean that regional differences cannot be addressed in the design process. In fact, balancing unified rules and regional disparities has been a key issue in the formulation of detailed rules for the national system, especially rules addressing the following three issues: the coverage and scope of ETS; allocation approaches and cap setting; and a monitoring, reporting, and verification (MRV) system.

2.1 Scope and coverage

It was provided in the US-China Joint Presidential Statement on Climate Change that China’s national ETS will cover “key industry sectors such as iron and steel, power generation, chemicals, building materials, paper-making, and nonferrous metals.” Although no formal announcement has been made on which specific sectors will ultimately be covered by the national system, it can be seen from the preparation work that the petro-chemical and domestic civil aviation sectors may also be covered by the national system in the first phase.⁶

This coverage and scope will have significant implications for the ETS pilot programs. Take Beijing as an example. In 2016, the Beijing pilot program covered around 947 enterprises with annual emissions higher than 5,000 tons of CO₂ in sectors including the building and public transportation sectors. Among those 947 enterprises, only 30 meet the mandatory threshold of the national system as a result of the significant gap between the scopes of the two systems. Table 4 provides a brief summary of the impacts of differences in coverage and scope of the national and pilot systems.

It can be seen that the most affected pilot systems are in municipalities where the service sector accounts for a significant part of the total emissions because it is not one of the sectors covered by the national system in the first phase. The question then is, how should those enterprises that have already been covered under the pilot programs although they do not meet the national threshold be treated? As these enterprises have already familiarized themselves with the ETS, meaning very limited additional administrative costs, and a broader scope will generally have no negative impacts on the environmental effectiveness of the system, it is provided in the Interim Measures that the provincial authorities may choose to extend the scope and cover-

6. National Development and Reform Commission, 2016. Notice on the Promoting the Progress of Key Work for the Start of National Carbon Emissions Trading. http://qhs.ndrc.gov.cn/qj/fzjz/201601/t20160122_791850.html.

TABLE 4
Entities Covered by the Pilot Systems and Possibly by the National System

Region	Number of Entities Covered by the Pilot System	Annual Emissions Cap of the Pilot (MtCO ₂ e)	Number of Entities to be Covered Possibly by the National System	Average Annual Historical Emissions (MtCO ₂)
Beijing	947	46	30	55
Tianjin	114	160	115	145
Shanghai	368	155	61	146
Chongqing	230	100	94	71
Guangdong	244	386	344	393
Hubei	236	253	203	219
Shenzhen	824	28	9	12
Total	2963	1128	856	1041

Sources: Various data by pilot trading systems.

age of the national system in their jurisdictions upon approval by the national ETS authority. However, they are not allowed to limit the scope and coverage of the national system in their jurisdictions. A flexible approach of this kind could also address the needs of regions in which some high-emissions sectors are not included in the initial list of mandatorily covered sectors.

This approach may also create challenges regarding emissions accounting and allowance allocation, as the guidelines on accounting and allocation for the additional sectors are not the priorities of the national authority and may not be ready for use. Since allowing provincial authorities to develop accounting and allocation guidelines may cause generous allocation issues, it has been proposed that allocation approaches to be utilized for these extended sectors shall be subject to approval by the national authority before application.

For the pilot authorities, there are two major options for dealing with enterprises that are included in the pilot systems but do not meet the mandatory coverage threshold. The first option is to exercise the flexibility offered in the Interim Measures by extending the coverage and scope of the national system in the pilot regions and proposing allocation approaches for the additional sectors. The second option is to continue the operation of the pilot systems, which will cover enterprises that are not covered by the national system. Due to the limited time before the start of the national system and the need for coordination with the national authorities on the extension of coverage and scope, it seems that the second option is more attractive to most of the pilot authorities in the initial stage of the national system's operation.

2.2 Allocation approaches and cap setting

Allowance allocation is one of the most important but controversial elements in the design and operation of an ETS, as it has direct and significant impacts on the distribution of costs among sectors and entities within sectors to achieve the system's emissions cap and thus also on the political acceptance of the cap. In the process of determining allocation approaches, many sometimes contradictory issues need to be considered and balanced, for example, environmental integrity of the system and cost containment measures.

Abundant analysis exists on the advantages and disadvantages of different allocation approaches such as auctioning, grandfathering, and benchmarking, from both theoretical and practical points of view. In China's pilot ETSs, the allocation approaches utilized for the same sector vary from system to system and have been evolving in some systems (Pang and Duan 2016).

As provided in the Interim Measures, unified allocation approaches will be applied across the whole country, and free allocation will be the main approach at the beginning, with the ratio of auctioned allowances increasing gradually. The main considerations in defining the allocation approaches under the Chinese system include: 1) providing a level playing field for enterprises in all regions; 2) addressing significant development uncertainties; 3) reducing political resistance; 4) ensuring consistency with other relevant policies; and 5) maintaining technical feasibility. International competitiveness of the sectors covered has not been one of the key factors affecting the decision.

Unified allocation rules do not necessarily mean that regional differences cannot be addressed and will simply be ignored during the allocation process. In practice, regional disparities will be addressed in the allocation process primarily by the following means : 1) appropriate definition of sub-sectors within which allocation rules will be the same; 2) flexibility given to the provincial-level authorities to use stricter allocation approaches; and 3) reserved allowances for some regions.

1) Appropriate definition of sub-sectors

In China's national system, the allocation approaches will differ not only among the eight sectors but also among the different sub-sectors of a given sector. For instance, different allocation approaches could be used for coal-fired power plants and gas power plants. How to divide one covered sector into sub-sectors is not only a technical issue but also in essence a political choice, reflecting decisions of the authorities on cost distribution and promotion of specific technologies.

In the process of dividing one covered sector into sub-sectors, regional differences could be addressed to some extent. Take the power generation sector as an example. If the same benchmark is applied to the whole power generation sector, it is clear from the very beginning that coal-fired power plants will be at a competitive disadvantage in comparison to gas power plants. Coal power plants in the western regions of China, usually utilizing less efficient technologies, will be more negatively affected than those in the eastern regions, which in most cases use more efficient technologies.

One possible means of addressing regional differences in the power sector is to define a sub-sector or sub-sectors covering technologies that are used mainly or solely in certain regions. In China, air cooling coal-fired power technology is mainly used in the western regions due to the limited water resources in these areas. A proposal has therefore been made to define a sub-sector for air cooling coal-fired power generation so that dedicated benchmarks could be developed for this sub-sector and special needs of the western regions could be considered. The greater the number of sub-sectors that are defined, the more regional disparities could be effectively addressed, but possibly at the cost of reduced efficiency of the whole system due to the bottom-up nature of the system's emissions cap. As the power sector accounts for a substantial part of the covered emissions, such an approach, even utilized in the power sector alone, could significantly alleviate concerns of the western regions regarding unified allocation approaches.

2) Flexibility to tighten allocations

As unified rules will be developed at the national level, and in light of the significant regional differences, it is reasonable to assume that the unified allocation approaches will be moderate, neither too strict nor too loose. Considering the higher emissions efficiencies of covered entities in the more developed regions and their tighter GDP CO₂ intensity reduction targets, authorities in these regions have expressed the concern that covered entities could easily fulfill their responsibility under the national system and that the mitigation burden left to the non-ETS sectors in their regions would therefore be too heavy. To address this issue, it has been proposed to give local authorities a degree of flexibility regarding allocations under the condition that this does not jeopardize the environmental effectiveness of the system.

Accordingly, it is provided in the Interim Measures that the provincial-level authorities could choose to use stricter allocation rules than the national unified rules or, in other words, allocate fewer free allowances to covered entities in their regions. They are not allowed, however, to use more generous allocation approaches.

The merit of such a rule is that local authorities can establish more ambitious mitigation targets for covered entities so that ETS sectors could make greater contributions to the achievement of the GDP CO₂ intensity reduction targets assigned to these regions by the central government. It is evident that addressing regional disparities is not an issue solely affecting less developed regions. To encourage the implementation of stricter allocation rules, the allowances saved will be kept by the provincial authorities for auctioning to generate revenues for mitigation and capacity building activities in their jurisdictions.

Whether they are willing to exercise such flexibility remains to be seen, as enterprises in these regions could express strong objections. Such a flexibility provision is not expected to have significant leakage effects as the overall aim of the approach is to promote the achievement of mandatory GDP CO₂ intensity reduction targets assigned to the regions, which have already been set regardless of the national ETS.

3) Reserved allowances for some regions

Western regions in China where further industrialization is needed value future emissions space more than others and have expressed serious concerns that the emissions cap to be imposed on them under the national system may have significant negative impacts on the development of new industrial projects in their jurisdictions. This concern is further heightened by the possibility that some of the intensively emitting projects could be located in these regions under certain national strategies, for instance, the "One Belt and One Road" strategy.

Whether this issue can be addressed, at least to some extent, will directly affect the attitudes of the western regions toward the national system. Although China has a very strong central government, the balance of interests between the central government and the provincial-level regions is very important as enforcement of rules relies heavily on the local authorities. To address this issue, it is provided in the Interim Measures that the national ETS authority will reserve a certain amount of allowances for new strategic projects, most to be located in the western regions. The allocation approaches for new entrants will be the same as for the existing enterprises. With this provision, however, regional authorities are assured that there will be a positive correlation between the emission caps to be assigned to them under the national system and the specific amount of emissions to be covered.

2.3 The MRV system: monitoring, reporting, and verification

Data is one of the most fundamental requirements of an ETS, and the MRV system plays a crucial role in ensuring data availability and quality. NDRC has published guidelines for accounting and reporting of emissions from enterprises in 24 sectors as part of efforts to ensure “a ton is a ton” throughout the whole system. It has already prepared eligibility requirements for third-party verifiers and technical guidelines for verification to be formally published pending the approval of the State Council regulation on the national ETS, which will be the legal basis for the publication.

Given the poor state of China’s current statistical system, the availability and quality of data at the entity level, not mentioning at the product level, is a huge challenge for China, especially in the central and western regions. Reporting and verifying historical data of covered entities will provide the data basis for starting the operation of an ETS. Launching the national system in 2017 will leave no possibility to establish a perfect statistical system beforehand, and a doing-and-improving approach will have to be applied.

To promote the preparation of the national system design, a de facto progressive and transitional approach has been used for historical data reporting and verification with the objective of creating unified rules. First, the accounting and reporting guidelines published by the national authority have been applied in all the regions, with improvements being made occasionally through various means such as clarifications. Second, the pending eligibility requirements for third-party verifiers and verification guidelines have been issued as recommendations rather than mandatory requirements to the local authorities, and some of the provisions in the documents, which vary in extent from region to region depending on local situations, have already been implemented. Third, although verification costs are generally paid by the authorities to avoid possible conflicts of interest, the verification fees per enterprise in different regions vary significantly depending on the specific public bidding rules and financial capacities in each region and potentially resulting in differences in the quality of verified data. Fourth, the supervision rules and procedures for third-party verifiers have differed. In some of the pilot regions, the verification outcome will be cross-checked by a fourth party to ensure quality through rules providing recognition in the case of success or sanctions in the case of failure. In other regions, no such rules are in place.

To address these challenges, it is proposed that the following actions be taken. First, a systematic review of the current emission accounting and reporting guidelines should be conducted shortly after the start of the national system, preparing a consistent and sound technical basis for the future. Second, greater efforts should be made to promote the approval of the State Council regulation as early as possible, laying the legal foundation for publishing mandatory eligibility requirements for third-party verifiers and verification guidelines. Third, financial resources from the national or local budget should be earmarked for the annual verification of data. Fourth, unified supervision rules and procedures for third-party verifiers should be established by the national authority.

❧ 3. POSSIBLE IMPACTS ON THE ECONOMY ❧

China has entered a new development stage called the “new normal”, and the idea of an ecological civilization plays a very important role in it. Controlling GHG emissions is one of numerous objectives cited in documents on the building of ecological civilization, and carbon emissions trading is one of the major mechanisms used to promote the achievement of this

target. In practice, however, the issue local authorities care about most is still economic development, and many of them, especially those in the regions now facing difficult economic situations, are concerned that the national system will worsen the economic situation and thus be resistant to this policy. In the past, command-and-control policies were utilized to improve energy efficiency and control GHG emissions, for instance, the 10,000-Enterprise Energy Conservation and Low Carbon Program, but the third-party verification component of such policies was very weak or even missing, resulting in limited pressure on local authorities and covered entities, and thus in poor outcomes.

Possible negative impacts on economic development concern not only local authorities but also some central government authorities that are deeply involved in the ETS policy formulation process. Some have even used this as an excuse to object to the national system or delay the process, motivated by unspoken objectives such as policy competition. To start the system on schedule, it is necessary for the national ETS authority to consider the interests of those that do not support the policy, including authorities at different levels and the industries to be regulated, and to compromise on the system design.

3.1 Allocation approaches

One important strategy the Chinese government has been promoting during the past several years is supply-side structural reform with one of the main underlying tasks being to address overcapacity. Several of the eight sectors that may be covered by the national system have had targets set for them in overcapacity policy: the power generation sector, the iron and steel sector, and the cement sector all have specific targets for reducing overcapacities. The challenge is that the local authorities are not very active in reducing overcapacities in their jurisdictions, with these sectors being important local tax sources.

Balancing the interests of different authorities regarding allocation is a very complicated process and has been made more difficult by the significant uncertainties of economic and sectoral development. The civil aviation sector, which will also be regulated under the national system, has been experiencing annual growth of about 13% during the past 20 years in China, in sharp contrast to many other sectors to be covered.

The ETS pilot systems faced the same challenges, more or less, during the system design stage, and free allocation approaches based on the intensity of production and real activity level have been utilized in many pilot systems to address these issues. When the level of real activity is used as the basis for allocation, the amount of free allowances one entity may be allocated depends on both the pre-determined intensity for corresponding products and actual production levels during a specific year. This could address both sectors with overcapacities and those experiencing rapid development, and it has been well accepted by covered entities in the pilot regions.

Inspired by the experiences in pilot regions, real production-based benchmarking and historical intensity approaches will be the preferred methods for free allocation in China's national system. Such approaches are also consistent with the overall carbon emissions control target set by the Chinese government, that is, the GDP CO₂ intensity reduction target up to 2030. As real production is used for free allocation, possible over-allocation is mainly connected to the possibly high benchmarks to be established. To avoid this, it is suggested that the proposed benchmarks be tested in the covered sector to identify the possible impacts on the sectors before the final decision is made, and in case of possible oversupply, the benchmarks should be tightened.

3.2 Stakeholder consultations

China lacks a tradition of wide stakeholder consultation, and in recent decades, command-and-control policies played a vital role in social and economic development. This has changed, however, in the development of both pilot and national systems. To fully understand and address the concerns of major market players, stakeholder consultations were given special attention through the integration of different practices into the system design. In general, views and suggestions have been sought in different forms mainly from the following types of stakeholders: governmental authorities, research organizations, consultants, specialized consulting organizations, covered industries, and the general public.

In China's pilot systems, views of other governmental authorities, such as those responsible for industry and energy conservation, are usually sought through formal inter-agency channels in written form. Whether and how their comments have been taken into consideration is presented by pilot ETS authorities to the pilot region governments in formal discussions on ETS design. Research organizations, consultants, and specialized consulting organizations (e.g., municipal/provincial expert committee on climate change) usually provide opinions in meetings. There are two ways input is sought from industries: through industrial associations and through direct communication with covered entities. Two approaches have been utilized to seek advice from the covered enterprises: bilaterally between the authority and the individual enterprise, and multilaterally. Bilateral consultation has been used for big entities with significant influence or when it is necessary to avoid a larger unified group making objections, while multilateral consultations are held for the purpose of improving the efficiency of consultations. In most cases, the general public's views have not been deliberately considered. It should be noted that some pilots have not sought views of all major stakeholders for reasons such as limited time available before final decisions were made and insufficient attention to the issue at hand.

Stakeholder consultation processes in China's national system have been very similar to those under the pilot systems, with the exception that more stakeholders are involved and more consultations are being conducted at different levels. In the pilot systems, views of major stakeholders are usually sought by the pilot ETS authorities themselves, while in the national system, consultations have also been conducted by the State Council Legislative Affairs Office in addition to those by NDRC to ensure more transparency and impartiality. In addition, consultations in the national system tend to cover more stakeholders than in the pilot systems, for example, the State Commission Office of Public Sectors Reform in charge of determining responsibilities of different central authorities and The Supreme People's Procuratorate of China.

Expanding the involvement of stakeholders in the consultation process should facilitate the implementation of the allocation approaches in the national system and prove beneficial overall. However, affected by its long-term tradition, consultations with industry in China are mainly carried out through industrial associations at meetings and are not very extensive or formal as compared to emissions trading systems in some other countries. Industrial associations represent the interests of the whole sector, including enterprises using less efficient technologies, and thus in some cases, their positions are different from those of advanced enterprises. It has therefore been proposed to involve advanced enterprises in the national ETS design process more directly to balance possible opposition from industrial associations.

In addition, as benchmarking is a sector-specific process involving the definition of specific products and development of emissions benchmarks for each product, NDRC has brought industries into the process that have a keen understanding of the sectors through either the

associations or representative enterprises. However, corresponding rules and procedures have been established to avoid possible conflicts of interest in the benchmarking process, as industries have a direct interest in the outcome and may push for more generous benchmarks. The major role of these industries in the benchmarking process is to put forward different choices with a detailed analysis of the possible impacts. Further analysis will be done by the expert organization in charge of allocation to identify the possible impacts of the proposed benchmarks on the interests of different sectors, and the final decision will be made by NDRC.

3.3 Comprehensive compliance rules

Strong compliance rules that specify the consequences covered entities will face in case of non-compliance are crucial for the achievement of the emissions control target of an ETS. NDRC has been trying very hard to establish effective compliance rules under the national system, but many aspects pose constraints, with the main one being the strict rules and procedures for establishing new administrative licensing. According to China's domestic rules, provisions for administrative licensing such as financial penalties exceeding a certain amount can only be established in laws or regulations, meaning that ministries including NDRC cannot establish these kinds of rules. However, passing laws or regulations is a very lengthy political process: more than two years have passed since the initiation of the national ETS regulation, and the proposed regulation is still in the review and revision process of the State Council Legislative Affairs Office.

Another issue that has been emphasized by many authorities during the consultations in addition to issues surrounding the lengthy process is that financial penalties should not be the sole or main consequence of non-compliance, as this is not the aim of the policy but an approach to promote compliance. The underlying concern is that financial penalties may provide incentives for the ETS authorities not to promote compliance by the entities and thus place an unnecessary financial burden on the industries.

To address these constraints and concerns, diversified compliance measures in addition to financial penalties have been established in the Interim Measures and the proposed regulation, including publication of non-compliance information on public media, informing relevant authorities such as the financial authorities of non-compliance activities, listing the non-compliance information in the credit system for enterprises that is managed by NDRC, and revoking the eligibility of enterprises to enjoy preferential policies of the government. It is worth mentioning that when non-compliance occurs under the national system, rules such as financial penalties will not be implemented immediately but enterprises will be given a grace period to remedy the situation.

4. EVOLVING POLICY CONTEXT

China is now in the process of comprehensively deepening the reform initiated by decision of the Central Committee of the Communist Party of China (CPC Central Committee 2013). Many policies that are related to carbon emissions trading, for example, trading of rights to use energy and reform the power sector, have been formulated and put into operation in parallel to carbon ETS, while no effective coordination among policies has been conducted. It is very important to bear in mind that all of the policies have been endorsed by the top leaders in the country and cannot be overruled by the carbon ETS. Therefore, the design of the national system needs to adapt to the broad policy context in which it will be implemented.

4.1 Focused target

China's national system will have cost distribution effects on the covered sectors mainly through allowance allocation, while the sectors are also regulated by many other relevant policies such as energy conservation and renewable energy policies. The necessity and urgency of coordination between carbon emissions trading and other related policies is well understood by the authorities, but this has had little effect in practice. There are two options for the national ETS authority to address this issue: 1) to conduct coordination first and then design the system; 2) to design the system in parallel to coordination or even without coordination.

As explained above, the implementation of carbon emissions trading in China faces a variety of serious challenges in addition to those surrounding coordination. For the design of the national ETS, what is most important is to kick-start a system that is generally well designed and to improve its design gradually, that is, to pursue the first option above. It is not in the interests of promoting carbon emissions trading to attempt to design and start a system that is perfect in theory. Rather, it is necessary to compromise on the design of some system elements.

One example is the treatment of indirect emissions, that is, emissions associated with the consumption of electricity and heat. This is an issue arising from the tight regulation of the power sector in China and thus associated with the specific Chinese situation. In China, both the feed-in tariff and retail price of the electricity are determined by governmental authorities, and the increase of electricity production costs therefore cannot be passed on to consumers. Some observers have argued that the establishment of the national ETS should be used as a tool to promote the reform process in the power sector. Such an expectation is not only an overestimation of the possible effects of the ETS but also a significant underestimation of the complexity of power sector reform in China. A practical solution to the cost pass-through issue is to cover both the direct emissions occurring in the power and heat generation process and indirect emissions connected to the consumption process. Covering the indirect emissions may increase electricity or heat consumption costs and create an incentive for consumers to reduce their consumption.

4.2 Flexible design

The process of comprehensively deepening the reform underway in China will last for many years, so the broad policy context in which China's national system will be operating will inevitably evolve over time. Therefore, it is crucial to keep the design of China's national system flexible to some extent in order to adapt to possibly changing situations in the future.

Take the power sector as an example. In 2015, the principle guiding document as well as a set of implementation guidance documents on the electric power market reform were issued (CPC Central Committee, State Council 2015; NDRC, National Energy Administration 2015). These documents paved the way for reforms to liberalize the electricity market in China, and the power sector reform piloting programs in most provinces have been approved by the national authorities. It is reasonable to expect that in the future, the pass-through of increased generation costs to consumers will no longer be a problem, and by that time, covering indirect emissions may not be necessary.

Another example is the main approach used to establish an emissions cap in China's national system. As discussed before, a bottom-up approach will play an important role in determining the emissions cap in the initial stage. However, with the peaking of China's CO₂ emissions by around 2030 or even earlier in the covered sectors, it will be much easier to establish absolute emissions control targets instead of intensity targets or to more precisely predict the

future emissions of the covered sectors and to establish an ex ante absolute emissions cap accordingly. By that time, the justification for relying mainly on bottom-up approach to establish the system's emissions cap may have vanished.

Considering the evolving policy context in which China's national ETS will be operating, it is essential that its design be flexible enough to allow for future adjustment. This is especially true for the framework documents that will guide the design and not change in the short term, for example, the regulation now under consideration by the State Council.

5. DIVISION OF RESPONSIBILITIES

In the design of China's national system, one issue that has been a focus of attention for all of the relevant authorities is the division of responsibilities among them, particularly between NDRC and provincial-level development and reform commissions and between NDRC and other central government authorities. Generally speaking, there are two kinds of responsibilities in the national system: those related to the development of rules and those related to their implementation.

To ensure that a unified national system is developed while at the same time maintaining incentives for the participation of the local authorities, a key principle of the design is: all responsibilities that could significantly affect the unification of the national system will be performed by the national authority, and all those that do not will be assigned to provincial-level authorities. In simple terms, the national authority is mainly responsible for the formulation of the rules and the provincial-level authorities are mainly responsible for the implementation of the rules. An overview of the major responsibilities of the national and provincial-level authorities is given in Table 5.

5.1 National authorities

According to the Interim Measures and the proposed regulation, NDRC as the national ETS authority will shoulder most of the responsibilities for the system design, including determination of coverage, allocation approaches, emissions cap, emissions accounting and verification guidelines, and development of the registry. As the design of some elements is politically very sensitive, the views of other relevant authorities, mainly members of the National Leading Group on Climate Change, will be sought formally during the process, and in some cases, approval from the central government will be needed. This will be the case, for instance, with allowance allocation and cap setting.

Some elements of the national system are closely related to functions of other authorities, and close coordination and a clear division of labor between NDRC and these authorities is a necessity. For example, accreditation of the third-party verifiers may fall well within the remit of the China Certification and Accreditation Administration, and the trading of financial derivatives of allowances within the remit of the China Securities Regulatory Commission. The Ministry of Finance will also play an important role in two aspects: earmarking financial resources in the public budget for verification purposes, and determining the use of revenues from the auctioning of allowances.

The coordination process has proven to be very lengthy and difficult, with the key issue being who will be taking the lead in performing relevant functions. Domestic civil aviation will be covered in the national system, and this sector is unique in terms of the mobile nature of the emitting sources and statistical system. There is also a special issue related to the management

TABLE 5
Division of Responsibilities between National and Provincial Authorities

Area	National Authority	Provincial Authorities
Coverage and Scope	<ul style="list-style-type: none"> • Geographical coverage • Gas coverage • Sectoral coverage • Emitting threshold 	<ul style="list-style-type: none"> • Name list of specific enterprises to be covered • Possibility to cover more sectors and lower emitting threshold
Allocation	<ul style="list-style-type: none"> • Allocation approaches 	<ul style="list-style-type: none"> • Calculation of amount of free allowances for each enterprise • Possibility to use stricter allocation approaches
Cap Setting	<ul style="list-style-type: none"> • Cap of the whole system and cap for each provincial-level region 	N.A.
MRV	<ul style="list-style-type: none"> • Guidelines on accounting, monitoring, reporting, verification • Eligibility requirements for verifiers • Accreditation and supervision of verifiers 	<ul style="list-style-type: none"> • Approval of monitoring plans • Receiving monitoring and verification reports • Determination of emissions of enterprises in the previous year for compliance purpose • Supervision of verifiers
Offsetting	<ul style="list-style-type: none"> • Offsetting rules 	N.A.
Compliance	<ul style="list-style-type: none"> • Determination of compliance rules • Enforcement of compliance rules for market participants other than enterprises 	<ul style="list-style-type: none"> • Enforcement of compliance rules for enterprises

of this sector: the question of whether NDRC or the Civil Aviation Administration of China (CAAC) should take the lead in establishing rules for it. It currently appears that a hybrid approach will be taken, with CAAC taking the lead in technical work and making recommendations to NDRC, while NDRC will be in charge of the final approval of the rules for this sector.

China's Ministry of Industry and Information Technology (MIIT), which is responsible for energy conservation policy formulation and implementation in the industrial sectors, may also play an important role in the system design and implementation process for two reasons. First, most of the covered sectors are industrial sectors under the supervision of MIIT, which in turn has great influence on these sectors. Second, dedicated teams under the guidance of MIIT—energy conservation and supervision corps or energy supervision corps—have been established in all provincial-level regions of China, and they want to play a role in facilitating compliance of covered enterprises in the national system. The challenge will be to agree on the coordination mechanism.

5.2 Provincial-level authorities

The provincial-level ETS authorities, in almost all cases provincial-level development and reform commissions, will play crucial roles in the operation of the national system, including calculating the specific amounts of free allowances for every covered enterprise in their regions, approving monitoring plans, receiving monitoring and verification reports, monitoring the

performance of the verifiers, determining the CO₂ emissions of covered enterprises, and enforcing compliance.

The greatest challenge local authorities will face in performing these responsibilities is a lack of managerial, financial, and technical capacities. Considering the differences among China's regions, there are concerns that some may not have the incentive to fully and effectively enforce the rules with the intention of protecting the competitiveness of enterprises within their regions. The central government has been working to earmark some financial resources in the national budget for verification purposes to alleviate the financial burden on the provinces and to prevent possible conflicts of interest. Large-scale capacity-building activities, supported by international organizations, national authorities, pilot regions, and many other entities, have been carried out to improve the managerial and technical capacities in non-pilot regions and relevant sectors. In addition, rules will be developed by the central government for the supervision of performance of local authorities in fulfilling their responsibilities.

✎ 6. CONCLUSIONS ✎

Significant progress has been made in regard to the development of China's national carbon ETS, but starting the system in 2017 as announced and ensuring smooth operations will require efforts to address diverse challenges ranging from political issues, such as creating a strong legal foundation, to technical ones, such as improving the poor statistical system.

The original design of China's national ETS has been significantly constrained by many issues, but it will need to be reviewed and improved periodically to take into account the real operation of the system and possible changes to the broad policy environment. In the review process, it is crucial to effectively coordinate, at least at the technical level, the design of the ETS and other closely connected policies, including the coal cap target, energy efficiency targets, economy-wide mitigation targets, power sector reform, and industrial policies. If not well coordinated, the system's efficiency and effectiveness will be impeded, possibly raising doubts as to the necessity of the system. In this regard, European experience in coordinating mitigation, renewable energy, and energy efficiency as well as ETS and non-ETS mitigation burdens could offer a very useful reference.

In the future review of the performance of the national system, it is important to keep in mind the special circumstances of China and to avoid directly adopting indicators used in other systems such as the EU ETS, where the design and operation of the system has been much less affected by other closely connected energy policies. The initial stage of China's national system should be viewed as a success if the following conditions can be met. First, there should be no significant flaw in the design that would make it necessary to change basic rules in the middle of the first phase. Second, the compliance rate should be sufficiently high to ensure the environmental effectiveness of the system. Third, the market price should not be too low for the system to affect the decision making of the covered enterprises. Fourth, the statistical systems of the covered enterprises should have been significantly improved. Market fluidity is a key factor in assessing the performance of a mature market, but it should not be used as one of the most important indicators for assessing China's national market in the initial stage. As improvements are made to the broad policy context in which the national system is operating and to the process of coordination between ETS and other relevant policies, more traditional economic and environmental indicators such as emission reductions could play an increasingly important role in assessing the performance of China's national system.

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References

- Cao, H., X. Tong, K. Chen and G. Li. 2015. "An Empirical Study of Regional Disparity of China's Carbon Emission." *Journal of Industrial Technological Economics* 2015(11): 84–96.
- CPC Central Committee. 2013. Decision of the CCCPC on Some Major Issues Concerning Comprehensively Deepening the Reform.
- CPC Central Committee and State Council. 2015. Opinions of the CPC Central Committee and the State Council on Further Deepening the Reform of the Electric Power System.
- Duan, M. 2015. "From Carbon Emissions Trading Pilots to National System: The Road Map for China." *Carbon & Climate Law Review* 2015 (3): 231–242.
- He, Y., H. Wang and J. Wang. 2016. "An Empirical Analysis of Regional Economic Development Differentiation in Chinese Eastern, Middle and Western Regions." *Journal of Nanchang Hangkong University-Social Science* 2016(3): 48–54.
- Jiang, J., B. Ye and X. Ma. 2014. "Policy design of the Hubei ETS pilot in China." *Energy Policy* 75 (12): 17–21. <https://doi.org/10.1016/j.enpol.2014.02.030>.
- Jiang, L. 2011. "Logic Behind the Action of Power Rationing." *Administrative Tribune* 18(6): 82–85.
- National Development and Reform Commission. 2014. Interim Management Measures on Carbon Emissions Trading.
- National Development and Reform Commission and National Energy Administration. 2015. Notice on Issuing the Supportive Documents for Further Deepening the Reform of the Electric Power System.
- Pang, T. and M. Duan. 2016. "Cap setting and allowance allocation in China's emissions trading pilot programmes: Special issues and innovative solutions." *Climate Policy* 16(7): 815–835. <https://doi.org/10.1080/14693062.2015.1052956>.
- Qi, S., B. Wang and J. Zhang. 2014. "Policy design of the Hubei ETS pilot in China." *Energy Policy* 75 (12): 31–38. <https://doi.org/10.1016/j.enpol.2014.07.010>.
- State Council. 2016. Notice of the State Council on Publishing the Work Program on Controlling GHG Emissions during 13th Five-Year Plan Period.
- Wu, L., H. Qian and J. Li. 2014. "Advancing the experiment to reality: Perspectives on Shanghai pilot carbon emissions trading scheme." *Energy Policy* 75 (12): 22–30. <https://doi.org/10.1016/j.enpol.2014.04.022>.
- Yang, M. 2011. "Gradually Establish Long-term Mechanism for Energy Conservation." *China Energy* 33(12): 25–28.
- Zhang, D., V. J. Karplus, C. Cassisa and X. Zhang. 2014. "Emissions trading in China: Progress and prospects." *Energy Policy* 75 (12): 9–16. <https://doi.org/10.1016/j.enpol.2014.01.022>.
- Zhang, X. and X. Chang. 2016. *The Logic of Economic Reform in China*. Beijing: China Social Sciences Press and Berlin/Heidelberg: Springer. <https://doi.org/10.1007/978-3-662-47404-4>.