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Market-driven Climate Policy in Two Systems

Strategic Development, Implementation, and Effectiveness of Emissions Trading Systems in the European Union and China

Nora I. Owen
Freie Universität Berlin – Student 5162260

Faculty Supervisors:
Dr. Maria Davydchyk, Freie Universität Berlin
Prof. Dr. Georg Meran, Technische Universität Berlin

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Together, the G20 states collectively account for more than eighty percent of global CO2 emissions.[1] Of the Group of Twenty, only China and the European Union have chosen to develop a carbon trading system at the national (or, in the EU's case, supranational) level. This paper will examine the development of the carbon market system in the European Union since the founding of its Emission Trading System, and compare its strategies, methods, and successes with those of the nascent emissions trading system under development in China. In addition, it will examine the institutional design of these two carbon markets – and emissions trading systems in general – as political and economic structures, with a particular focus on allocation. Finally, it will compare the political goals and measurable results of the two emissions trading systems, and explore connections therein to the systems' institutional design differences.

Chiefly, this paper will seek to answer a guiding question: how does the institutional design of Europe's Emission Trading Scheme differ from the developing "Low Carbon Development Pilot Program" emissions trading system in China? By exploring the mechanisms of structural implementation, the political goals, and the measurable effects, I will draw conclusions regarding optimal strategies for carbon trading systems' implementation. Because this paper will focus on institutional design, economics will not be a primary focus; nevertheless, I will rely on data from the European Commission, the Chinese government, and a number of third party sources from relevant academia, international institutions, and public data records to support and challenge arguments related to the topic of emissions trading.

While this analysis will balance comparison between the two systems, the much shorter history of the Chinese system means that much is still unknown regarding its implementation. Much of the section on China, therefore, will concern the institutional designs of the eight Chinese "pilot" systems with which the country has made its first tentative steps towards emissions trading. I will attempt to survey the outlook for the Chinese scheme fairly, and to properly acknowledge space for further developments in the implementation of that country's carbon market. As with the section of the paper that focuses on the European emissions market, however, in instances where the market mechanisms appear to fall short or lack notable elements core to the European ETS, I will

[1] Global Carbon Atlas. *CO2 Emissions*. 2017. *Annual CO2 Emissions*.

note that as well. This paper is, after all, first and foremost intended to be a researched comparison between disparate institutions.

This paper will be divided into several sections. First, I will briefly cover the history of emissions trading as a tool of public policy, relying heavily on the work of Prof. Jan-Peter Voß at Technische Universität Berlin to identify significant trends in the early development and academic progress of carbon trading as a hypothetical, then practical policy tool, and to establish a foundation upon which I will then explore some of the lessons to be learned from the successes and failures of these policies over time. While much of this early conceptual development took place in the United States, significant policy leaps were also achieved in Europe, and both are important to include here for contextual reasons of policy decision-making described later on in the thesis. Notable among these is the ability of EU ETS participants to take advantage of international emissions reduction mechanisms like those of the United Nations Framework Convention on Climate Change under the terms of the domestic ETS structure, a feature that not only has proven valuable to the European Union's emissions market, but also to China's nascent market as well.

Next, I will write about the institutional design choices possible when developing an emissions market, and the different objectives and priorities tied to each. This paper is not an analysis of emissions trading in general. But it would be entirely impossible to do justice to the topic of comparing institutional design of multiple specific emissions market systems without at least a substantial acknowledgement and overview of the most important choices involved with the development of emissions trading systems as common policy. This section of the thesis will draw heavily from publications by the World Bank and the OECD, alongside a number of academic experts in the field from both the political and economic aspects of the subject. Particular focus on questions of allocation and enforcement will form core parts of this section.

After covering the history and design choices of carbon market systems, the next sections of this thesis will be devoted to examining the European Union and Chinese emissions trading systems as unique entities. Each emissions market was developed with a unique set of intentions, means of implementation, and long-term strategies. In order to ensure that this thesis covers the relevant academic ground on this developing topic, I will focus this part of the paper on the institutional design choices made in the political

development of these programs, rather than their economic or legal underpinnings. Nevertheless, a few vital economic considerations are key to a comprehensive overview of certain policy choices and their consequences, and will be explored in appropriate detail.

The following sections of the thesis will attempt to relate the choices made in the contemporary political development of the European Union and Chinese emissions markets to the historical outcomes of similar policy choices, and then to evaluate the areas of potential risk and areas of likely success for the two market schemes. In the interest of remaining impartial, these evaluations will not be judgments of value; rather, I will do my best to demonstrate particular qualities, institutional design choices, or trends that seem likely to make a distinct positive or negative impact of the outcome of each emissions trading system going forward, based on how those qualities, choices, or trends affected previous emissions trading policy endeavors.

In sum, I will comprehensively and plainly identify the main issues around which the two emissions markets in focus have evolved, are evolving, and will evolve, and the implications of such development for institutional design of emissions trading systems in general. What hurdles, for example, does an authoritarian government like the People's Republic of China face when implementing an emissions trading scheme that a union of democratic government – the European Union – does not? Conversely, are there specific areas in which the Chinese ability to develop and implement policy quickly lends the Communist Party more flexibility in its emissions market implementation than its European Union counterpart? For these questions and more, I will rely heavily on the work of researchers from both Europe and China, as well as third-party evaluations from the United States and Australia. By collating the two systems' decision-making processes and priorities, I will establish a general set of noteworthy areas of comparison and contrast.

I. Development of Emissions Trading as a Policy Instrument

One of the chief challenges to reducing greenhouse gas emissions is the lack of a direct cost to the emitter. While there are myriad indirect costs to the global climate (and by extension, humanity at large) from emissions, in a traditional market system the polluter

must only account for the costs of doing business, not the costs of its waste. Since greenhouse gas emissions are generally simply released into the atmosphere, it is incredibly easy, in the absence of some enforced cost mechanism, for polluters to disregard emissions costs to society at large. After all, the ultimate indirect costs – air pollution, climate change, rising sea levels, et cetera – are not borne directly by the polluter. In a sense, this is the prototypical problem of an unaccounted-for externality; in a multilateral system with many inputs and outputs, the entities causing a problem may have no individual incentive to stop causing said problem, much less to work to solve it.[2] In the absence of some regulatory authority, a hypothetical system involving a number of emitters sees improved outcomes for the general public (i.e. the global climate) only at their own initiative – which is to say, only once it becomes less costly to abate emissions than to continue emitting greenhouse gases at business-as-usual levels. As the scientific consensus on global climate change – and the general trend towards inaction of emitters not incentivized by emissions trading or carbon taxes – has made clear, that hypothetical point of less cost will not arrive in time to avert climate catastrophe.[3] Governments, therefore, must take decisive action to limit emissions should their citizens wish to play a part in diminishing negative impact on global climate, by imposing costs on emitters.

Emissions trading, alternatively called "cap and trade", is a policy approach to achieve emissions reduction in a market economy by eliminating the aforementioned externality problem in pollution. Instead of allowing pollutants (in this case, greenhouse gases) to simply be emitted freely into the atmosphere, emissions are made a scarce – and therefore valuable – commodity.[4] A public entity with legal authority is given the ability to distribute, via sale or allocation, a specified number of certificates corresponding to a specific quantity of emitted pollution.[5] Generally, emissions certificates are traded by the ton, though certificates are often used in bulk at much higher numbers. Polluters may not only purchase or receive these certificates; they may also sell them to other polluters, or in some cases sell them back to the issuing body of government. A market for emissions is

[2] Stavins, Robert N. "Experience with Market-Based Environmental Policy Instruments." *SSRN Electronic Journal*, vol. 01, no. 58, 1999, 10.2139/ssrn.199848. Accessed 26 July 2019.
[3] Intergovernmental Panel on Climate Change. "Global Warming of 1.5 °C —." *Ipcc.Ch*, Global Warming of 1.5 °C, 2019, www.ipcc.ch/sr15/.
[4] Stavins, Robert N. "Experience with Market-Based Environmental Policy Instruments." *SSRN Electronic Journal*, vol. 01, no. 58, 1999, 10.2139/ssrn.199848. Accessed 26 July 2019.
[5] ibid

thus established. As a consequence of emissions costs being attached back to the polluter via this market mechanism, polluting entities in the market system are incentivized to reduce emissions independently, without direct government intervention.[6]

Over time, in the ideal carbon trading model, the public entity responsible for issuing emissions certificates will draw down the number of certificates issued. This generally happens at a steady, predetermined rate designed to ensure market scarcity continues to be preserved, though mid-term adjustments can take place should the market mechanism fail to induce the necessary degree of incentive. As the supply of certificates falls with time, the cost of polluting grows, and polluters respond either by shifting industry away from polluting processes or investing in technology to reduce their emissions. After several years of this system, issued emissions certificates are eventually reduced to zero, by which time the emissions of sectors managed by the emissions trading system (ETS) are eliminated entirely, at least within the covered sectors of the ETS.[7]

The first policy responses to the developing problem of greenhouse gas emissions were in fact developed before the widespread scientific consensus about anthropogenic climate change was established. In the late 1960s and early 1970s, the United States' National Air Pollution Control Administration sought a policy-level strategy to ease the impact of then-devastating smog outbreaks in major American cities[8]. The NAPCA (which now exists as a subsidiary office of the modern U.S. Environmental Protection Agency) ran a series of test analyses across several cities[9], using a statistical approach to select "the least-cost combination" of emissions regulations for emitters that could be designed responsively to reach a particular air quality level.[10] The results of those tests, refined into more generally-applicable models, began what Jan-Peter Voß of Technische Universität

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[6] ibid

[7] Organisation for Economic Co-operation and Development. "Emissions Trading: Trends and Prospects (Archived)." *http://Iea.Org/Papers/2007/ET_Trends&Prospects.Pdf*, 2010, web.archive.org/web/20111103100702/iea.org/papers/2007/ET_Trends&Prospects.pdf. Accessed 13 July 2019.

[8] Kuklinska, Karolina, et al. "Air Quality Policy in the U.S. and the EU – a Review." *Atmospheric Pollution Research*, vol. 6, no. 1, Jan. 2015, pp. 129–137, 10.5094/apr.2015.015. Accessed 18 July 2019.

[9] ibid

[10] Burton, Ellison S., and William Sanjour. "A Simulation Approach to Air Pollution Abatement Program Planning." *Socio-Economic Planning Sciences*, vol. 4, no. 1, Mar. 1970, pp. 147–159, 10.1016/0038-0121(70)90036-4. Accessed 15 July 2019.

Berlin calls the "Gestation" period of emissions trading as a policy tool.[11]

After the establishment of the EPA in 1970, the theory behind emissions markets continued to be developed further in the United States. Several papers on the subject of market externalities and incentive-based emissions reduction were written at this time, and would come to establish much of the foundation for future practical implementation of the economic theory behind emissions trading.[12] As a definitive policy measure, however, the emissions market instrument did not become explicitly and firmly realized until the 1977 revision of the 1963 Clean Air Act[13], under which firms were permitted to collect a kind of proto-emissions certificate from the federal government in exchange for buying out competitors' industrial pollution.[14] Voß calls this the second, or "Proof of Principle" stage, at which the emissions trading system was functionally implemented (albeit on a rather minor level) in a practical, real world setting.[15]

The United States continued to lead the development of environmental economics policy into the 1990s. In 1990, the US Congress passed a suite of further amendments to the Clean Air Act, one of which contained the framework for the world's first so-called "cap-and-trade" legislation.[16] The new law, which was designed to address disappointing results in combating sulfur dioxide and nitrogen oxide emissions under previous CAA iterations, established new protocols under which these acid rain-causing pollutants could be regulated on a market certificate system.[17] Allowances for sulfur dioxide and similar pollutants were sold by the overseeing EPA, and a total nationwide cap was established.[18] The system proved resoundingly successful, swiftly cutting sulfur dioxide below half 1980

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[11] Voß, Jan-Peter. "Innovation Processes in Governance: The Development of 'Emissions Trading' as a New Policy Instrument." *Science and Public Policy*, vol. 34, no. 5, 1 June 2007, pp. 329–343, 10.3152/030234207x228584. Accessed 18 July 2019.
[12] Coase, R. H. "The Problem of Social Cost." *The Journal of Law and Economics*, vol. 3, Oct. 1960, pp. 1–44, 10.1086/466560. Accessed 16 July 2019.
[13] United States Environmental Protection Agency. "Evolution of the Clean Air Act | US EPA." *US EPA*, 21 Nov. 2018, www.epa.gov/clean-air-act-overview/evolution-clean-air-act.
[14] Voß, Jan-Peter. "Innovation Processes in Governance: The Development of 'Emissions Trading' as a New Policy Instrument." *Science and Public Policy*, vol. 34, no. 5, 1 June 2007, pp. 329–343, 10.3152/030234207x228584. Accessed 18 July 2019.
[15] ibid
[16] US EPA,OAR. "1990 Clean Air Act Amendment Summary | US EPA." *US EPA*, 21 Nov. 2018, www.epa.gov/clean-air-act-overview/1990-clean-air-act-amendment-summary. Accessed 10 July 2019.
[17] Voß, Jan-Peter. "Innovation Processes in Governance: The Development of 'Emissions Trading' as a New Policy Instrument." *Science and Public Policy*, vol. 34, no. 5, 1 June 2007, pp. 329–343, 10.3152/030234207x228584. Accessed 18 July 2019.
[18] ibid

levels by 1995.[19] By the mid-1990s, climate change had become a political issue, and the scientific consensus on its anthropogenic roots was emerging as consensus.[20] Consequently, politicians, economists, and scientists began seriously considering an array of policies at the macroeconomic level that might arrest or at least ameliorate the developing problem of runaway greenhouse gas emissions. Having proven successful at managing the acid rain crisis in the United States, the emissions market scheme would gain traction by the turn of the century as a potentially applicable (and more importantly, politically viable) policy response to climate change. Although the structure of such a market applied to a swathe of emissions sectors rather than a single pollutant class would necessitate significant refinements to the design of emissions trading schemes, the potential long-term reductions to net emissions without significant economic disruption made the concept appealing enough to see political daylight in the European Union.[21]

2005 saw the official rollout of the European Union Emissions Trading System, or "EU ETS". Shortly after its establishment, the new EU emissions market included roughly one-half of the EU's CO2 emissions, and roughly 40% of its net greenhouse gas emissions. The latter half of this thesis will focus in depth on the European Union and Chinese emissions trading systems, and will take into account the history of and approaches undertaken by both schemes. But it would be inaccurate to imply that emissions markets have been limited to those two polities; across the globe, dozens of emissions trading systems exist as of 2019. The most prominent of these are in Australia, South Korea, and certain states of the USA, notably California.[22] Though none approach the scale of the EU or Chinese ETS ambitions, they do represent a general trend towards emissions trading as an increasingly popular and viable mechanism for use across a diverse array of political systems, national economies, and regions. On occasion, this paper may note certain similarities or differences between the subject emissions markets and these other emissions

[19] ibid
[20] Oreskes, Naomi. "The Scientific Consensus on Climate Change." *Science*, vol. 306, no. 5702, 2 Dec. 2004, pp. 1686–1686, www.sciencemag.org/cgi/reprint/306/5702/1686.pdf, 10.1126/science.1103618. Accessed 11 July 2019.
[21] Voß, Jan-Peter. "Innovation Processes in Governance: The Development of 'Emissions Trading' as a New Policy Instrument." *Science and Public Policy*, vol. 34, no. 5, 1 June 2007, pp. 329–343, 10.3152/030234207x228584. Accessed 18 July 2019.
[22] OECD (2002), *Implementing Domestic Tradeable Permits: Recent Developments and Future Challenges*, OECD Publishing, Paris, https://doi.org/10.1787/9789264191983-en.

markets that have been highlighted by researchers in the cited documents on institutional design.

In order to facilitate an effective comparison between the European Union and Chinese emissions trading systems, it is important to first describe a number of fundamental issues at the core of institutional design of emissions trading systems. While each of the following points is applicable to the topics evaluated in the later portions of this thesis, they are in turn further applicable to emissions markets in general, and even to the developing international ambition of global carbon market linkages. For this reason, the experiences of the European Union, China, and other developing emissions trading systems in applying and testing the various approaches to emissions markets' institutional design will likely prove invaluable to states and international organizations who in the future might seek to establish emissions trading systems of their own.

II. Emissions Market Designs

Emissions trading schemes, in simplest terms, are fundamentally a means of reducing emissions via market mechanisms at the lowest possible cost. In their 2012 paper on the subject, titled "Designing Emissions Trading in Practice", Dr. Peter Heindl and Dr. Andreas Löschel of the Leibniz Centre for European Economic Research note that emissions markets can be a "counterpart", in many ways, to the prototypical Pigouvian tax (which may not assign costs and benefits to optimal degrees of efficiency).[23] That is to say, in an emissions trading system, the destructive relevant collective outcomes (in this case, the negative effects of greenhouse gas emissions on global and local climate) are minimized via policy implementation, and applied more fairly to the initiators of said social costs – greenhouse gas emitters – rather than remaining disconnected and applicable exclusively to the everyday taxpayer when the deleterious consequences of climate change take place. By establishing a scarce resource in emitted greenhouse gas pollution, cost – and therefore, negative incentive – is applied directly where it had been previously avoided:

[23] Heindl, Peter, and Andreas Löschel. "Designing Emissions Trading in Practice - General Considerations and Experiences from the EU Emissions Trading Scheme (EU ETS)." *SSRN Electronic Journal*, vol. 12, no. 009, 2012, 10.2139/ssrn.2014666. Accessed 21 July 2019.

at the source, with the polluter.[24]

It should be noted that emissions market systems are distinct in important ways from carbon taxes or emissions taxes. There is no tax directly applied to greenhouse gas emissions under a typical emissions trading scheme (though carbon taxation can exist in parallel). In a carbon tax system, the government charges a definite, standardized percentage of calculated cost directly to the emitter, at the time the pollution is created.[25] There are certain advantages to this approach, namely the immediate creation of a calculable negative incentive that is easily applied to emissions at all levels within the economy, entirely independent of scale. But carbon taxation struggles in certain other regards, where it is outmatched by emissions markets. For one, emissions trading schemes offer a level of flexibility that make them much less politically volatile, since in principle individual emitters might not be required to make any immediate changes whatsoever, depending on how certificates are allocated across a national economy's various sectors and which sectors are prioritized by a particular government for emissions reduction. Additionally, in a market system, emitters may have access to "recycled" certificates (either purchased directly from other emitters or via third-party mechanisms, such as those of the United Nations Framework Convention on Climate Change[26]), cheaper options for purchasing emissions certificates via the market mechanism, and even – though controversial – "grandfathered" permits, freely allocated without cost at the prerogative of the relevant national government.[27]

Carbon taxes, by contrast, present emitters with a flat cost that must be paid, limiting strategic behavior. It should be noted that both carbon taxes and carbon markets are considered effective by economists.[28] Both mechanisms manage and incentivize healthy

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[24] Haites, Erik, et al. "Experience with Carbon Taxes and Greenhouse Gas Emissions Trading Systems." *SSRN Electronic Journal*, 2018, scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1358&context=delpf, 10.2139/ssrn.3119241. Accessed 6 Aug. 2019.

[25] Heindl, Peter, and Andreas Löschel. "Designing Emissions Trading in Practice - General Considerations and Experiences from the EU Emissions Trading Scheme (EU ETS)." *SSRN Electronic Journal*, vol. 12, no. 009, 2012, 10.2139/ssrn.2014666. Accessed 21 July 2019

[26] International Energy Agency. *Emissions Trading and CDM (Archived)*. 2014, web.archive.org/web/20160101222214/www.iea.org/topics/climatechange/subtopics/emissionstradingandcdm/.

[27] Neelis, Maarten, et al. *Developing Benchmarking Criteria for CO2 Emissions*. Ecofys Netherlands, The Fraunhofer Institute for Systems and Innovation Research, 2009.

[28] Haites, Erik, et al. "Experience with Carbon Taxes and Greenhouse Gas Emissions Trading Systems." *SSRN Electronic Journal*, 2018, scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1358&context=delpf, 10.2139/ssrn.3119241. Accessed 6 Aug. 2019.

social behavior of polluters, encourage technological innovation, and measurably decrease emissions over time. It also possible, and in fact common, for an economy to make use of a hybrid system, taking elements of both carbon taxes and emissions trading schema. Several European Union Member States, France notably among them, make use of carbon taxes in addition to their participation in the EU ETS.[29] The very brief comparison between the two systems here is not a value judgment so much as an evaluation of the political, economic, and social challenges and advantages of implementing either.

In practice, all emissions trading systems make use of one fundamental mechanism: the quantity restriction, or the "cap". In order to apply scarcity to emissions, this cap is established prior to a designated trading period, and reduced – generally in a linear fashion, though not always – over time. As described above, emissions certificates, which are tied precisely to a particular quantity of pollution, are distributed – allocated – by the relevant national authority to emitters in the covered economic sectors. These certificates must be returned to the overseeing authority by a predetermined deadline, and must be verified against observed and recorded emissions in order to prevent fraud. But most important in developing the institutional design of a carbon market is establishing the specific operative goal of the emissions trading system itself. While an emissions trading system can be reliably expected to encourage technological development, push emitters towards cleaner alternatives to production, and properly allocate costs from pollution onto the responsible parties[30], the degree to which it achieves each of these goals is determined by the configuration of its institutional design. Designating particular ambitions, therefore, is necessary from the beginning. Several guiding questions that must be answered during the design stage of an ETS are mentioned in the World Bank's 2016 paper "Emissions Trading in Practice"[31] (not to be confused with the similarly-titled paper by Professors Heindl and Löschel referenced earlier):

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[29] Lucas, Barbara. "The Carbon Tax That Keeps On Giving | Energy Policy Institute at University of Chicago." *Uchicago.Edu*, Energy Policy Institute at the University of Chicago, 2019, epic.uchicago.edu/news-events/news/carbon-tax-keeps-giving. Accessed 18 July 2019.

[30] ibid

[31] Kerr, Suzi; Lubowski, Ruben; Ward, John; Marijs, Cor; Sammon, Paul; Guigon, Pierre; Haug, Constanze; Acworth, William; Leining, Catherine; Murphy, Leah; Wagner, Gernot; Rittenhouse, Katherine; Mehling, Michael Arthur; Matthes, Felix Christian; Duan, Maosheng. 2016. "Emissions trading in practice: a handbook on design and implementation" (English). Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/353821475849138788/Emissions-trading-in-practice-a-handbook-on-design-and-implementation

- How much of a particular economy's emissions reduction goals are intended to be met by the emissions trading system, as opposed to some other mechanism or policy initiatives undertaken by other means?
- How are the benefits of the emissions trading system distributed? How are the costs distributed?
- What level of economic cost is acceptable, as the effects of the emissions market ripple through the economy?
- If the emissions trading system collects revenue via government auction of permits, certificates, or allowances, how will that revenue be distributed?
- At what rate should decarbonization be attempted? Are there particular clean energy or abatement goals that the ETS much play a role in meeting?
- By how much should the government (or overseeing body) restrict the yearly sale of emissions certificates? Should this percentage increase over time, or should it remain steady?
- Will the emissions trading scheme make use of third-party or international-level emissions reduction initiatives, such as the Clean Development Mechanism of the United Nations Framework Committee on Climate Change? If so, will emitters be permitted to directly interface with these mechanisms, or will the overseeing body act as an intermediary?
- What local economic or political concerns exist that may limit or enhance the effectiveness of the emissions trading system? Are there particular concerns about economic viability or existing (and potentially overlapping) energy transition policies that could complicate the implementation of a new ETS?[32]

Allocation, and the methods by which allocation is carried out, are critical to the success of an emissions market. During the initial operative period of an emissions trading scheme, governments must designate permits or certificates in a formalized fashion that is both fair to the participants and creates equal incentive to reduce emissions across the board, without additional weight given to particular industries or sectors. According to the International Carbon Action Partnership (ICAP), an international organization that

[32] ibid

specializes in carbon market policy and emissions trading institutional design, there are several approaches to the question of how allocations for emissions should be distributed. One, auctioning, is the most closely tied to the market mechanism, in that it is affected by shifts in the price of emissions.[33] As ICAP's 2019 paper "The Use of Auction Revenue from Emissions Trading Systems: Delivering Environmental, Economic, and Social Benefits" notes, auctioning is a good way to tie an emissions trading scheme directly to politics, as the funds from auctioning can be easily distributed into the government revenue stream. This effectively produces a consistent source of state income, towards which politicians seeking public approval for emissions trading systems can point to demonstrate not just the promised ecological effects, which may be more difficult to observe, but a clear source of funding for other state endeavors.[34] ICAP's paper also notes that "reinvestment of auction proceeds can generate jobs and economic benefits directly to local economies" – some, undoubtedly, in the covered sectors themselves.[35]

Auctioning allowances, as opposed to other methods of distribution, has a number of direct benefits to the efficiency of the market mechanism as well. Unlike other methods, such as freely allocating certificates to emitters, auctioning the allowances ensures that emitters are forced to absorb some cost: either purchasing the certificates, or investing in their operations to abate emissions.[36] This maintains the incentive-based mechanic that is core to the idea behind emissions trading from the beginning of the process. Additionally, auctioning allowances has been shown to be more effective at ensuring that the emitters who use the most certificates are able to obtain them.[37] It prevents misallocation by free distribution, through which an emitter might provide incorrect data and be assigned too many or too few certificates by mistake – or worse, by an intentional attempt to circumvent the market system. Through auction, no such opportunities for misallocation arise, as emitters are legally bound to pay the cost of emissions, one way or another. Finally, auctioning avoids the problem of special interest, in which even a well-meaning government may over-allocate or under-allocate to a particular sector on account of some

[33] Santikarn, M., Kardish, C., Ackva, J. & Haug, C. (2019). *The Use of Auction Revenue from Emissions Trading Systems: Delivering Environmental, Economic, and Social Benefits.* Berlin: ICAP
[34] ibid
[35] ibid
[36] Neelis, Maarten, et al. *Developing Benchmarking Criteria for CO2 Emissions*. Ecofys Netherlands, The Fraunhofer Institute for Systems and Innovation Research, 2009.
[37] Santikarn, M., Kardish, C., Ackva, J. & Haug, C. (2019). *The Use of Auction Revenue from Emissions Trading Systems: Delivering Environmental, Economic, and Social Benefits*. Berlin: ICAP

incorrect perception of that sector's relative contribution to the economy, political popularity, or prior degree of abatement. Auctioning allowances circumvents this problem, ensuring emitters purchase exactly as many emissions certificates as they need, and no more.[38]

But other methods of allocation exist, and have certain advantages as well. Most systems make use of a combination of methods to distribute emissions certificates. One of these is benchmarking, or the process of evaluating emitters based on prior emissions, and allocating emissions permits based on observed historical trends.[39] This is a difficult task, and requires robust systemic observation and reliable, up-to-date record-keeping, as well as firm policy implements to ensure policy connection to allocation once the data is collected. In 2009, the European Commission's Environment Directorate-General sponsored a study entitled "Developing Benchmarking Criteria for CO2 Emissions".[40] The authors – researchers at Ecofys Netherlands and the Fraunhofer Institute for Systems and Innovation Research – proposed eleven key "allocation principles that could form the basis for a benchmark-based allocation methodology".[41] The full paper describes each in detail, includes a great deal of supplemental data, and it is useful for an overview of the subject to describe each here briefly.

- The first and eighth principles concern the benchmark level – the level at which permit allocation for emissions is determined. According to the Commission paper, benchmarks should be "based on the most energy efficient technology". Essentially, the development of new technologies should not interfere with the ultimate aim of the emissions market to incentivize emissions reduction. At no point should emitters find it cost-effective to cease innovating. Additionally, technology should play a role in establishing new benchmarks for particular fuels.
- The second, third, fourth, and seventh principles concern benchmarking details; namely, that one should not overemphasize such details. Distinctions

[38] ibid
[39] Törner, Anna, et al. *Benchmarking in the EU: Lessions from the EU Emissions Trading System for the Global Climate Change Agenda*. Center for European Policy Studies, 2010, www.ceps.eu/wp-content/uploads/2010/06/TFBenchmarking11062010.pdf.
[40] Neelis, Maarten, et al. *Developing Benchmarking Criteria for CO2 Emissions*. Ecofys Netherlands, The Fraunhofer Institute for Systems and Innovation Research, 2009.
[41] ibid

between older and newer technologies (except where there concern the first principle), age or size of facilities, climate, or fuel type – among others – complicate the ability of the allocation body to make fair allocation decisions, and limit the efficiency of the emissions trading system once allocated.

- The fifth and sixth principles address the issue of product differentiation. In keeping with the overall theme of limiting divergence and granularity of benchmark allocation, the Commission researchers urge emissions market system operators not to use separate benchmarks for different products unless those products are "traded between installations", or have "verifiable production data [...] based on unambiguous and justifiable product classifications".
- Principles nine and ten urge allocation authorities to "use historical production to allocate allowances", and to rely on existing (and "product-specific") methods of data collection and storage to determine benchmark allocations, in order to facilitate allocation that is as closely tied to relevant production numbers as possible.
- Finally, the eleventh principle concerns the issue of insufficient data. In this eventuality, the authors recommend that auction authorities create a "generic efficiency improvement factor for heat consumption" together with an existing benchmark for heat production in order to generate a benchmark that can substitute for one missing enough data to be generated via standard means.[42]

As these eleven principles make apparent, monitoring emitters and properly allocating emissions certificates is a difficult, but potentially valuable and effective means of emissions reduction. Beyond these eleven principles, governments have a number of options by which they can approach allocation. Allocating certificates corresponding on historical emissions, otherwise known as "grandfathering", is one such method, and is undoubtedly the simplest. In a grandfathered system, the allocation authority will distribute emissions credits according to historical emissions by sector or by individual emitter. This

[42] ibid

has benefit of relying on data that in most cases exists already, requiring no further administrative burden to observe further activity. Additionally, since it distributes allocation towards those industries and emitters which have historically produced the highest levels of emission, in principle it also connects those emitters more directly to the new emissions trading mechanism, and incentivizes them to take part in the market with the credits they have been allocated.[43]

However, grandfathering of allocations has significant drawbacks as well. As noted by the Commission's aforementioned paper on allocation as a policy tool, grandfathering of emissions certificate allocation can complicate or even damage the effectiveness of an emissions trading system. For one, grandfathering allocation risks "rewarding high historic emissions, rather than early action"[44] – in effect, rather than incentivizing participation, higher shares of emissions allocations might instead incentivize *inaction* in terms of emissions market participation and in technological development. Secondly, grandfathering makes it very difficult to accommodate differences in markets when multiple countries or regions (the Commission paper makes note of Member States of the EU in particular)[45] are covered by the same market scheme. There is little to prevent a larger market's highest-emitting industries from absorbing the bulk of emissions allocation for a particular state in a purely grandfathered allocation system. Additionally, should new a country or region enter the coverage zone of the emissions market, there is be no way to seamlessly connect its industries to the grandfathered allocation system. Finally, the concern of windfall profits looms largest over grandfathering allocations as a significant issue. Should an emitter with high historic emissions decide to shift the "costs" of free allowances onward to consumers, the emission market becomes merely a way to justify increased prices for the emitter, and a source of potentially-volatile political backlash against the emissions trading system itself, which allowed the price distortion to take place.[46]

Because the risk of these distinctly unfavorable outcomes is fairly significant in a

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[43] Törner, Anna, et al. *Benchmarking in the EU: Lessions from the EU Emissions Trading System for the Global Climate Change Agenda*. Center for European Policy Studies, 2010, www.ceps.eu/wp-content/uploads/2010/06/TFBenchmarking11062010.pdf.
[44] Neelis, Maarten, et al. *Developing Benchmarking Criteria for CO2 Emissions*. Ecofys Netherlands, The Fraunhofer Institute for Systems and Innovation Research, 2009.
[45] ibid
[46] Törner, Anna, et al. *Benchmarking in the EU: Lessions from the EU Emissions Trading System for the Global Climate Change Agenda*. Center for European Policy Studies, 2010, www.ceps.eu/wp-content/uploads/2010/06/TFBenchmarking11062010.pdf.

traditionally-allocated "grandfathered" system, the Commission-sponsored paper proposed alternative approaches for use in the later phases of the EU emissions trading system. They are, however, universally applicable to emissions market certificate allocation policy in general. One of these, of course, is to reduce the number of total free allocations, and shift towards an increased emphasis on auctioning instead. The Commission paper's authors list a number of reasons for such a shift,[47] referencing a number of the advantages described earlier in overviewing allocations auctioning. In addition, they urge a general shift towards a system more reliant on benchmarking than on grandfathering.[48] The definition for the former term is specific in this context, and here described as "the comparison of performance (with respect to greenhouse gas emissions) against peers".[49] The emission benchmark, thereafter, is expressed as "a predefined value for the specific emissions for a certain activity" which "can be differentiated by products, fuels, and technologies."[50] The specifics of the complex systems involved with benchmarking (and the Commission researchers' thorough analysis of the topic) are too complex to explore in this thesis. Indeed, the Commission paper itself calls the process of establishing a benchmarking system "complicated and demanding".[51] Nevertheless, a few conclusions in particular are relevant here. First, use of benchmarking – in accordance with the eleven principles laid out earlier in this section – is a preferable approach to free allocation than grandfathering, and potentially a preferable approach to auctioning, if well executed. The main challenges, according to the research, are ensuring:

- "Availability of all data required for all sectors, all products, and all Member States" (the latter qualifier, of course, being specific to the EU ETS or other multinational emissions trading systems).
- "The quality of the required data and the possibility for (independent) verification and monitoring."

[47] Neelis, Maarten, et al. *Developing Benchmarking Criteria for CO2 Emissions*. Ecofys Netherlands, The Fraunhofer Institute for Systems and Innovation Research, 2009.
[48] ibid
[49] ibid
[50] ibid
[51] ibid

- "The confidentiality of the data and the resulting need for an independent entity governing the data without disclosing details."[52]

Should governments and/or allocation authorities be capable of achieving each of these, however, the Commission researchers argue that "a transparent and applicable benchmark-based allocation methodology can be developed and that no a-priori bottlenecks exist in developing such methodology".[53]

Unlike the suite of advantages offered by auctioning, emissions certificate allocation instead holds to the single major advantage that it ensures a high level of direct policy control over the process of emissions allocation. In so doing, governments and regulatory authorities maintain a firm grasp on the fundamental functions of the emissions trading scheme, and may influence its outcomes and starting positions based on interests that may not be strictly economic. This can, of course, be good or bad for the effectiveness of the emissions trading system, depending on the changes made and the reliability of the allocation methods in question.

The World Bank, alongside the Organization for Economic Co-operation and Development (OECD), authored a specific framework for carbon pricing mechanisms that succinctly covers the various mechanisms and points above. Named the "FASTER Principles", these points serve as aspirational guiding markers for carbon trading systems in their infancy:[54]

- "Fairness" – an understanding of and responsiveness to the unequitable sources of emissions, that "[distributes] costs and benefits equitably, avoiding disproportionate burdens on vulnerable groups", along the lines of the so-called Polluter Pays principle.
- "Alignment (of policies and objectives)" – the carbon market should not only act as a mechanism for emissions reduction in a vacuum, but also as a general-use tool for inciting positive outcomes in areas of policy interest

[52] ibid
[53] ibid
[54] Organisation for Economic Cooperation and Development (OECD) and the World Bank Group (WBG). *The FASTER Principles for Successful Carbon Pricing: Public Disclosure Authorized*. 2015.

across many fields and healthy market responsiveness to the ongoing industrial changes.

- "Stability (and predictability) – the emissions trading system should engender trust and confidence in the general public, private industry, and politicians, in order to "give a consistent, credible, and strong investment signal, whose intensity should increase over time".
- "Transparency" – the market mechanism should be easily comprehensible, its operations open, and its goals public.
- "Efficiency (and cost-effectiveness)" – the market mechanism is intended to *reduce* and *minimize* the costs of emissions reduction; over time, it should stimulate an increase in economic efficiency.
- "Reliability (and environmental integrity)" – the success of the trading system must be measurable not just degrees of abatement and economic adaptation, but in quantifiable "reduction[s] in environmentally harmful behavior".[55]

The FASTER principles are very general, but they encapsulate much of the main considerations involved in designing emissions trading systems. Though the World Bank and OECD designed the principles for usage in developing economies, the FASTER basics are applicable near-universally, and its goals are shared by all emissions trading systems, including those in developed economies.

A final consideration worth briefly mentioning is the steady, and to some degree unconscious, march towards a global market for emissions. The proliferation of emissions trading as a policy tool across much of the world in the past decade has resulted in the gradual development of a competitive market that crosses ETS boundaries.[56] A multinational corporation, for example, may need to participate in different emissions markets in different parts of the world, potentially facing different costs in each. In order to prevent imbalances in this worldwide global emissions market, it is in the interest of the authorities behind existing emissions trading systems to consider linkages between the domestic system and foreign ones. This is, of course, a complicated task in both the

[55] Organisation for Economic Cooperation and Development (OECD) and the World Bank Group (WBG). *The FASTER Principles for Successful Carbon Pricing: Public Disclosure Authorized*. 2015.
[56] Wara, Michael. "Is the Global Carbon Market Working?" *Nature*, vol. 445, no. 7128, Feb. 2007, pp. 595–596, www.nature.com/articles/445595a.pdf, 10.1038/445595a. Accessed 9 Aug. 2019.

political and economic sense, but there are some frameworks for linkages that can be useful to policy-makers looking to connect their mechanisms to a more global market. In the specific cases of the European Union ETS and the Chinese ETS, these considerations would likely be of particular importance, given the sheer scale of both systems relative to the rest of the world, and the accordingly large influence each has in the developing and informal global market for emissions.

According to the paper "Joint Emissions Trading as a Socio-Ecological Transformation", published jointly in 2006 by the German Federal Ministry of Education and Research (BMBF) and a number of independent researchers, there are several "critical design issues" that are integral to linkage of domestic emissions trading schemes.[57] Unlike questions of domestic institutional design, international linkages of emissions trading systems are not hindered by differences in sector coverage, since competition across trading regimes would occur regardless of whether or not the trading regimes in question were linked.[58] In fact, the BMBF argues that "differences in sector coverage may actually have a positive effect on economic efficiency, since the cost savings emissions trading achieves stem from the differences in emissions abatement cost among the participants."[59] While coverage is not a limiting factor for emissions trading system linkages, however, other details are very important indeed. For one, trading units, and their standardization and recognition across ETS boundaries, are core to linkage. Differences in policy – concerning, for example, acceptance of third-party emissions credits from the United Nations Clean Development Mechanism – can become sticking points in a hypothetical linkage mechanism. Additional questions can arise concerning the details of scheme targets (i.e. whether the linked market seeks to impose absolute caps, such as the EU ETS, or restrict emissions intensity, such as the Chinese system), as well as in disparities in monitoring, penalties for violators, and banking allowances.[60]

Of course, talk of linkages on a global scale, especially between the EU ETS and such a newly-established system as the Chinese ETS, is aspirational at best in 2019. Currently, the only major emissions system linkage is that between the EU and the Swiss

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[57] Sterk, Wolfgang, et al. *JET-SET: Joint Emissions Trading as a Socio-Ecological Transformation Cross-Section Project 4* "Ready to Link Up? Implications of Design Differences for Linking Domestic Emissions Trading Schemes." German Federal Ministry of Education and Research (BMBF), July 2006.
[58] ibid
[59] ibid
[60] ibid

ETS.[61] Nevertheless, the challenges associated with the issue should undoubtedly be considered ahead of time at the institutional design level. Over time, as a global emissions market comes into existence naturally via development of emissions trading systems (linked or otherwise), it would be to the benefit of emissions trading system operators to have frameworks and mechanisms in place for the inevitable push towards linkage with other systems. After all, the overall efficiency improvements achieved when emissions trading systems become linked make the goal of a worldwide system of emissions market linkages a worthwhile one indeed. For now, however, the world's emissions trading systems must firmly establish themselves as pillars of the international effort to combat climate change and fulfill the objectives of the Paris Agreement.

III. The EU ETS

The European Union first implemented its emissions trading scheme in 2005. Officially the "European Union Emissions Trading System", the EU ETS was the first emissions trading system of significant scale ever established.[62] At the time of its implementation, the EU ETS included all twenty-four of the then-Member States of the European Union – including, notably, the United Kingdom, which since 2002 had run its own limited national emissions trading scheme.[63] Upon rollout, roughly forty percent of total CO2 emissions EU wide were included in the market mechanism, with a goal to increase this proportion over time. Officially, this included all of the following sectors in the participating Member States:

- All "energy activities" – (defined by the EU as combustion installations with a thermal input above twenty megawatts, coke ovens, and mineral oil refineries)

[61] Haites, Erik, et al. "Experience with Carbon Taxes and Greenhouse Gas Emissions Trading Systems." *SSRN Electronic Journal*, 2018, scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1358&context=delpf, 10.2139/ssrn.3119241. Accessed 6 Aug. 2019.
[62] "EU Emissions Trading System (EU ETS)." *European Commission*, 23 Nov. 2016, ec.europa.eu/clima/policies/ets_en. Accessed 10 Aug. 2019.
[63] ENVIROS Consulting Ltd. "Appraisal of Years 1-4 of the UK Emissions Trading Scheme (Archived)." *United Kingdom National Archives*, 2006, webarchive.nationalarchives.gov.uk/20090807041040/www.defra.gov.uk/environment/climatechange/trading/uk/pdf/ukets1-4yr-appraisal.pdf. Accessed 5 Aug. 2019.

- Ferrous metals production
- "Mineral industries", including ceramics, cement, and glass
- All "pulp, paper, and board activities"[64]

Notably excluded from the initial version of the Emissions Trading System were aviation emissions and automotive emissions. Although aviation only accounted for three percent of EU emissions in 2002, the sector was then (and remains) the fastest-growing of all emissions sectors, but by 2017 still only made up 2% of the total transportation emissions share.[65]

The EU ETS was designed as a staged rollout, to take place over designated (pre-determined) "trading periods". Each of the three trading periods to date has been designed with the intention of managing the specific details of the ETS scheme in a responsive, experimental way.[66] To some extent, this tentative approach to institutional design is a positive feature that enhances the emissions market's ability to create responsive policy. However, the staged rollout has also faced criticism that its style of implementation is in fact a constraining factor in the trading scheme's ability to successfully achieve its goals of general across-the-board emissions reduction.[67] Either way, one indisputable benefit of the phased approach to emissions market design is that administration of the market scheme has been able to decisively respond with needed adjustments in response to crises, rather than being limited to gradual adjustments over time.

The first trading period of the EU emissions market took place between the system's establishment in 2005 and the end of 2007. During Phase I, the EU ETS was rolled out to the then-24 Member States via the new allocation scheme, and participants (public and private) were immediately able to begin direct transactions and market buying and selling. These allocations were handled via free allocation in the basic grandfathering

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[64] "BBC NEWS | Science & Environment | Q&A: Europe's Carbon Trading Scheme." *Bbc.Co.Uk*, 2015, news.bbc.co.uk/2/hi/science/nature/4114921.stm. Accessed 6 Aug. 2019.

[65] European Environment Agency. "Annual European Union Greenhouse Gas Inventory 1990–2017 and Inventory Report 2019." *European Environment Agency*, 2017, www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2019. Accessed 4 Aug. 2019.

[66] ---. "European Commission - PRESS RELEASES - Press Release - Questions and Answers on the Revised EU Trading System." *Europa.Eu*, 2012, europa.eu/rapid/press-release_MEMO-08-796_en.htm. Accessed 11 Aug. 2019.

[67] Teeter, Preston, and Jörgen Sandberg. "Constraining or Enabling Green Capability Development? How Policy Uncertainty Affects Organizational Responses to Flexible Environmental Regulations." *British Journal of Management*, vol. 28, no. 4, 6 Sept. 2016, pp. 649–665, 10.1111/1467-8551.12188. Accessed 2 Aug. 2019.

fashion, which would come to have significant consequences.[68] Since the EU ETS is a multinational emissions trading system that relies on the participation of individual national government in order to function, each participating Member State handled its domestic allocation process via National Allocation Plan, which, as previously noted, relied on the European Commission to approve or send back.[69] The framework by which the Commission evaluated these plans, the 2003 Emission Trading Directive, was focused on ensuring compliance with the responsibilities of states under the Kyoto Protocol, but included additional restrictions in order to ensure intra-EU fairness, proper infrastructure for monitoring, reporting, and verification, and a mechanism for penalization of violations.[70]

Phase I faced significant challenges, however. Most significantly for the market, the emissions certificate allocation system had over-allocated allowances to several EU countries: Belgium, Czech Republic, France, the Netherlands, and Spain. All six countries were granted more emissions tonnage in emissions certificates than their domestic emitters had actually produced during the first two years of Phase I.[71] Effectively, this outcome meant that the market scheme not only failed to restrict net emissions for these countries during Phase I, but it also failed to incentivize transition to alternative energy sources, since emitters were able to produce their expected tonnage without even reaching the certificate limit. This over-allocation and the subsequent market response led to a fall in the price of carbon certificates, as the abundance of the ostensibly scarce "resource" became apparent to ETS market participants. By 2007, market price for carbon had sunk as low as €0.10 per ton, down from a peak of €29.20 in 2006 (before the over-allocation was discovered).[72]

Emissions among the twenty-four Member States participating recorded a net rise of

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[68] "BBC NEWS | Science & Environment | Q&A: Europe's Carbon Trading Scheme." *Bbc.Co.Uk*, 2015, news.bbc.co.uk/2/hi/science/nature/4114921.stm. Accessed 6 Aug. 2019.
[69] European Commission. "National Allocation Plans." *European Commission*, 23 Nov. 2016, ec.europa.eu/clima/policies/ets/pre2013/nap_en.
[70] European Commission. *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61/EC*. 25 Oct. 2003, eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32003L0087. Accessed 22 July 2019.
[71] Buchner, Barbara K., and A. Denny Ellerman. "Over-Allocation or Abatement? A Preliminary Analysis of the EU ETS Based on the 2005 Emissions Data." *SSRN Electronic Journal*, 2006, 10.2139/ssrn.946091. Accessed 19 July 2019.
[72] ibid

just under two percent.[73] (Bulgaria, Malta, and Romania were not recorded in Phase I, since they did not join the European Union until 2007). While it was unclear from the beginning of its rollout if Phase I of the ETS would in fact reduce emissions, the failure of the Phase I trading scheme to make a significant effect on the general long term trend line of business-as-usual emissions made re-examination of the entire endeavor a priority, both at the European Union's institutional level and in the policy responses of the participating Member Countries.[74] Phase I was not an outright failure, and some abatement did take place, amounting to roughly 2.8% of the projected European Union emissions had the emissions trading scheme not been implemented.[75] Additionally, the late discovery of the over-allocation problem underscored the vital importance of accurate data collection for proper utilization of the emissions market scheme, especially given the vast difference between the target degree of Phase I emissions reduction – 12.7% – and the actual outcome of barely a fifth that percentage.

Professors Barry Anderson of University College Dublin and Corrado Di Mari of Queen's University Belfast write, in their paper "Abatement and Allocation in the Pilot Phase of the EU ETS", that there are three "key elements for the success of an emissions trading scheme", based on their evaluation of the outcomes from Phase I:

- Trustworthy data
- Centralization of the allocation process (in Anderson and Di Mari's words, "top-down" cap-setting)
- A large amount of auctioning of emissions certificates, in contrast to higher degrees of direct transactions, which "[limit] the possibility of windfall gains for the participants in the scheme, […] reducing strategic behavior and rent-seeking."[76]

The first phase of the EU ETS struggled to achieve all three of these elements. While emissions data was reliably transmitted and recorded, it was not sufficiently collected and

[73] European Commission. "European Commission - PRESS RELEASES - Press Release - Emissions Trading: 2007 Verified emissions from EU ETS Businesses." *Europa.Eu*, 2012, europa.eu/rapid/press-release_IP-08-787_en.htm?locale=en. Accessed 30 July 2019.
[74] Anderson, Barry J., and Corrado Di Maria. "Abatement and Allocation in the Pilot Phase of the EU ETS." *SSRN Electronic Journal*, 2010, 10.2139/ssrn.1417962. Accessed 5 Aug. 2019.
[75] ibid
[76] ibid

collated in time to prevent the late discovery of the significant over-allocation issues. While centralization of the allocation process was "top-down" in principle, since the EU Commission approved the final apportionment, there was no real pressure from the "limited" allocations to incite true emissions reduction. Indeed, the grandfathered approach to free allocations meant that incentives actually worked to some extent in the opposite direction, with firms seeing opportunities to pass along costs rather than innovate.[77] Finally, while some auctioning did take place, a concerning number of direct transactions took place, leading to accusations of insider knowledge and high-level misconduct to take advantage of blind spots in the distribution scheme of the ETS.[78]

This final point is worth additional attention in particular, since certain institutional weaknesses of the early EU ETS were critical gaps through which unintended – and potentially malicious – behavior were allowed to take place. Because there was little focus on the market mechanism (as opposed to the direct transfers), emitters sold their certificates in bulk, all at once, creating "windfall profits" that further drove down the price of carbon under the mechanism.[79] This was specifically a consequence of the allocation method in particular, since the Phase I allocation was done mostly via grandfathered free allocation. The incentives for emissions reduction, as a consequence of these institutional shortcomings, were thus significantly reduced from their optimal state, and Phase I outcomes were similarly limited in effectiveness.

Phase II of the EU ETS began in the shadow of Phase I's mistakes and lessons, but on the whole enjoyed more success than the pilot trading period. During Phase II, which lasted from 2008 through the end of 2012, the 24 originally participating Member States were joined by the three new Member States of the European Union – Bulgaria, Malta, and Romania – as well as by three participating non-members: Iceland, Liechtenstein, and Norway[80]. The new additions brought the total number of participating countries to 30. Additionally, Phase II was the first to include the new rules of the so-called "Linking Directive" from the European Commission, which allowed Member States participating in

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[77] EUROPEAN COMMISSION Directorate -General for Climate Action. *EVALUATION OF THE EU ETS DIRECTIVE Carried out within the Project "Support for the Review of the EU Emissions Trading System."* 2015.
[78] Sijm, Jos, et al. "CO2cost Pass-through and Windfall Profits in the Power Sector." *Climate Policy*, vol. 6, no. 1, Jan. 2006, pp. 49–72, 10.1080/14693062.2006.9685588. Accessed 25 July 2019.
[79] ibid
[80] European Commission. "The EU Emissions Trading System (EU-ETS)." *EU ETS Infosheet*, 2016, ec.europa.eu/clima/sites/clima/files/factsheet_ets_en.pdf.

the EU ETS to make use of United Nations Clean Development Mechanism and Joint Implementation credits as part of their ETS market participation and legal allocations.[81] The Commission decided that Phase II would also be the first to include aviation emissions in the emissions allocation system, a politically sensitive decision that resulted in hostile reactions from both international airline corporations and from other countries – notably China and the United States – who felt that applying EU-level emissions restrictions to international carriers was a violation of international law.[82] Chinese financial pressure and American legal pressure resulted in a retreat from full inclusion of the aviation sector in the ETS; ultimately, only intra-European Economic Area flights would be included.[8384] At the end of 2023, this restriction may be re-evaluated to again attempt inclusion of international flights within the trading scheme;[85] it remains to be seen whether a second piece of legislation will be more successful at coercing international cooperation than the last.

Further adjustments to the ETS were established as part of Phase II. In addition to the expansion to the aviation sector, a number of other sectors were also included for evaluation (though not allowances/caps), in order to include them in the third phase of ETS trading. In principle, these measures were intended to bring the EU ETS to full coverage across all sectors – and, by extension, to include all greenhouse gas emissions from the Member States and other participating countries – within the mechanisms of the emissions market and trading scheme.[86] While the National Allocation Plans were retained, the failures of Phase I's allocation system prompted the ETS authorities to shift a portion of allocations to auction, rather than free allocation. This change would not take effect,

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[81] International Institute for Sustainable Development (IISD). "Linking in the EU ETS Bulletin." *Iisd.Ca*, 2012, www.iisd.ca/sd/euets/ymbvol115num1e.html. Accessed 30 July 2019.
[82] "Trouble in the Air, Double on the Ground." *The Economist*, 11 Feb. 2012, www.economist.com/node/21547283. Accessed 20 July 2019.
[83] European Commission. "Reducing Emissions from Aviation." *Climate Action*, 23 Nov. 2016, ec.europa.eu/clima/policies/transport/aviation_en. Accessed 15 July 2019.
[84] United States Congress. *An Act to Prohibit Operators of Civil Aircraft of the United States from Participating in the European Union's Emissions Trading Scheme, and for Other Purposes.* 27 Dec. 2012, www.govinfo.gov/content/pkg/PLAW-112publ200/pdf/PLAW-112publ200.pdf.
[85] German Emissions Trading Authority. "DEHSt - Expansion of Emissions Trading to Other Sectors." *Dehst.De*, 2018, www.dehst.de/EN/understanding-emissions-trading/developments/other_sectors/other_sectors_node.html. Accessed 21 July 2019.
[86] European Union. "National Allocation Plans." European Commission, 23 Nov. 2016, ec.europa.eu/clima/policies/ets/pre2013/nap_en. Accessed 1 Aug. 2019.

however, until the completion of Phase II.[87]

Unfortunately, Phase II experienced many of the same issues of pricing during the observation period. Throughout the second phase, prices for emissions remained more stable than they had during the first phase, but there was a general long-term fall that became even steeper after the failure of a 2009 climate conference in Copenhagen to prescribe legally binding emissions reduction goals (China vetoed the core elements of the agreement).[88] By 2010, the allowance prices had reached €12.40 per ton. The slide continued through 2012 and the end of the second phase, ending at €6.67 per ton.[89] It thus became clear that significant revisions to the EU ETS' structure would be necessary if the system was to fulfill the objectives of the Commission and the Member States, to say nothing of the ambitions for global emissions reduction at the United Nations level.

Phase III began with several major changes, most importantly the abolition of the National Allocation Plan system that had essentially placed the Member States between European emitters and the European Commission as middlemen responsible for distribution of allocation certificates.[90] Instead of the individual Member State caps, from 2013, the Commission would set an EU ETS-wide cap, to which all Member States and participating associate states would need to collectively adhere.[91] Additionally, the Phase III revisions imposed restrictions on banking allowances, a phenomenon that had augmented the problem of windfall profits and been central to the endless price falling. Finally, and importantly, the Phase III changes included a wholesale shift from allowances to auctioning[92]. Beginning in the 2013 cycle, the emitters of the ETS' thirty-one countries (after Croatia's accession) would acquire their allocations via competitive auction, except for a portion reserved as part of the newly-established "New Entrants Reserve", or NER, a framework designed to further incentivize "low-carbon" innovation, such as Carbon Capture and Storage (CCS) and general abatement measures applicable to energy producers

[87] European Commission. "European Commission - PRESS RELEASES - Press Release - Questions and Answers on the Revised EU Trading System." *Europa.Eu*, 2012, europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/796. Accessed 17 July 2019.
[88] BBC News. "BBC News - Copenhagen Deal Causes EU Carbon Price Fall." *Bbc.Co.Uk*, BBC, 2015, news.bbc.co.uk/2/hi/business/8425293.stm. Accessed 2 Aug. 2019.
[89] ibid
[90] United Kingdom Stationery Office. *Carbon Markets and Carbon Prices*. First Report of the Committee on Climate Change, Dec. 2008.
[91] ibid
[92] ibid

and industry.[93] Phase III would last through the end of 2020.[94]

Prices during Phase III hit an immediate setback with the further collapse of the emissions price to just under 3 euros per ton emitted in January 2013. The large number of banked emissions allocations brought over from Phase II further prolonged this price depression.[95] However, over time, the price again began to rise, a trend which – besides a few small dips during 2016 and 2017, has continued mostly uninterrupted through 2019. As of July 2019, the price for emissions allocations under the EU ETS was €27.95 per ton[96], a strong figure that both incentivizes abatement and serves as an attractive number for emissions market participation for investors. Phase III, therefore, has been by far the most effective of the EU emissions trading system's phases. Its success has made a strong case for the role of auctioning in allocating emissions certificates, as well as the collectivization of emissions caps at the EU level.

Mechanisms of the EU ETS were devised with the intention of achieving not just internal goals of the Commission and the Member States, but also fulfilling certain specific ambitions of the 1997 Kyoto Protocol and its 1992 predecessor, the United Nations Framework Convention on Climate Change.[97] In the Kyoto document, several "flexible mechanisms" were proposed and their institutional frameworks developed:

- The Clean Development Mechanism, and associated Certified Emission Reductions, or CERs. The Clean Development Mechanism is primarily designed as a framework for both developed and developing countries to begin a process of emissions reduction via market-based trading schemes.
- Joint Implementation projects, and associated Emission Reduction Units, or ERUs. Joint Implementation projects are a framework by which developed countries can assist (via direct investment) in a emissions reduction project in another developed country, receiving emissions reduction credits (ERUs) that count towards binding domestic emissions reduction targets.

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[93] "Emissions Cap and Allowances." European Commission, 23 Nov. 2016, ec.europa.eu/clima/policies/ets/cap_en. Accessed 6 Aug. 2019.
[94] International Emissions Trading Association. *The EU's Emissions Trading System*. 2009.
[95] Carrington, Damian. "EU Carbon Price Crashes to Record Low." *The Guardian*, The Guardian, 14 Feb. 2018, www.theguardian.com/environment/2013/jan/24/eu-carbon-price-crash-record-low. Accessed 5 Aug. 2019.
[96] https://www.investing.com/commodities/carbon-emissions-historical-data
[97] European Commission. "Phases 1 and 2 (2005-2012)." *Climate Action*, 23 Nov. 2016, ec.europa.eu/clima/policies/ets/pre2013_en. Accessed 30 July 2019.

- International Emissions Trading. Of the three Kyoto Protocol flexibility mechanism frameworks, IET is naturally the most immediately applicable to the EU ETS. Under treaty specifications, however, International Emissions Trading can include national policy that takes advantage of the other two flexibility mechanisms as well. Importantly, the International Emissions Trading mechanism also includes the ability for national governments to acquire Certified Emission Reduction certificates by investing in emissions reduction in developing states.[9899]

The EU ETS collectivizes the European Union Member States' participation in international emissions reduction systems like those established in the Kyoto Protocol. National emissions caps, still established individually, are confirmed by the European Commission and monitored by both national and EU-level observation.[100] The allocation approved for individual Member States can then be distributed to private or public sector emitters per domestically-established policy methods. Being a market-based emissions trading scheme, the ETS allows emitters to trade their allocations, either on an open market, via a direct seller-to-buyer transaction or via a third-party broker. Because the mechanisms of the Kyoto Protocol frameworks are integrated into the European market system, emitters (public or private) who are able to qualify for either Certified Emissions Reduction certificates or Emissions Reduction Unit credits can use these mechanisms to fulfill their obligations and meet the allocation restrictions established under national allocation requirements.[101] Under the modern (Phase II and later) ETS, the United Nations Framework Convention on Climate Change acts as a third layer of authorization (after the national and EU) layers for ensuring fair accounting of both net emissions and emissions allocation crediting.[102]

A notable element of the early EU ETS was its reliance on the Member States to set

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[98] United Nations. *Kyoto Protocol to the United Nations Framework on Climate Change*. 1998, unfccc.int/resource/docs/convkp/kpeng.pdf.
[99] Zachman, George. "The Carbon Buyers' Club: International Emissions Trading Beyond Paris." *Policy Brief*, no. 3, Mar. 2017.
[100]"Registry Systems under the Kyoto Protocol." *UNFCCC*, https://unfccc.int/process/the-kyoto-protocol/registry-systems.
[101] European Environment Agency. *National Emissions Reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism*. European Environment Agency, 22 July 2019, https://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-unfccc-and-to-the-eu-greenhouse-gas-monitoring-mechanism-14.
[102] ibid

allocation policy relatively autonomously. Although the Commission ultimately approved the national allocation schemes, this flexibility permitted a great deal of national – and even regional – policy approaches to emissions reduction for compliance with allocation restrictions. This ability to individually develop policy was also beneficial to the European Union as a political union; rather than the allocation schemes being dictated unilaterally from above, Member States were encouraged to collaborate both with each other and with the Commission itself in order to ensure sustainable and politically viable emission reduction policy. The loose approach to allocation, however, resulted in the less-than-impressive results of Phase I, and, to some degree, Phase II as well. With Phase III changing the national caps to an EU-wide cap, this element of autonomy has been diminished somewhat, but there remains strong influence of the European Council (and by extension, Member State governments) in confirming important structural changes to the emissions trading system's mechanisms, such as the minimum reserve price legislation added into Phase III/IV. Additionally, the Commission still relies on participating national governments to ensure cooperation from domestic emitters, making the Member States still vital to the Monitoring, Reporting, and Verification (MRV) process.[103] This mutual reliance builds institutional trust and strength over time, and retains for the Member States the necessary political room to set climate policy as best suits their needs.

On the other hand, however, there are certain disadvantages to this approach. For one, without a top-down suite of specific sector emission reduction priorities, it becomes difficult to incentivize specific market-wide sector-based reduction goals. So long as participating Member States meet their agreed-upon targets, this is not a problem, and net emissions will decrease naturally over time under the pressure of the market mechanism. If the targets are not met, however, and the authority of the market mechanism and its enforcement bodies are undermined, the lack of an express avenue for policy direction could mean a cascading degradation of the emissions market mechanism itself. So far, this scenario has not come to pass, but the intransigence of politicians in certain participating Member States – notably Poland[104] – in earnestly working to fulfil their previously-agreed emissions reduction targets could engender such a crisis scenario in the future, should the

[103] Koch, Nicolas, et al. "Causes of the EU ETS Price Drop: Recession, CDM, Renewable Policies or a Bit of Everything?—New Evidence." *Energy Policy*, vol. 73, 2014, pp. 676–685., doi:10.1016/j.enpol.2014.06.024.
[104] Meijknecht, Anna. "Realizing EU ETS Monitoring and Compliance in Poland." *Polish Yearbook of Environmental Law*, no. 5, 2015, p. 7., doi:10.12775/pyel.2015.001.

carefully-managed balance between the Member States and the Commission break down unexpectedly.

IV. EU ETS – Performance and Outlook

Europe's Emissions Trading System is the largest active emissions market in the world, the main conduit for industry emissions in nearly three dozen countries, and the likeliest foundation for a hypothetical global emissions market that could well one day encompass the bulk of human greenhouse gas production. In many respects, it has enjoyed unprecedented success; the EU has met its emissions reduction goals set so far, and is on track to meet its goals for emission reduction in 2020, 2030, and 2050.[105] Today, the EU ETS accounts for more than three quarters of all international carbon trading.[106]

A comprehensive literature review on the subject of EU ETS effectiveness was published by Freiburg's Öko-Institut in 2015. "Effectiveness", the Öko-Institut paper specifies, "refers to the extent to which the intervention caused the observed effects and whether or not these effects correspond to the objectives of the intervention". The 2015 document, which evaluates performance in relation to the goals of the then-recently-established 2030 Framework of the European Council (approved in 2014), qualifies its analysis along three categories: long-term impacts, short-term results, and outputs. "Long-" and "short-" term, in this context, refer to both intentional and unplanned outcomes, accounted for by the systems of the ETS mechanism or not.

In December 2018, the Organization for Economic Co-operation and Development (OECD) published a paper titled "The Joint Impact of the European Union Emissions Trading System on Carbon Emissions and Economic Performance", in which it evaluated the effects of the EU ETS as they relate to the specifics of the policy suite.[107] The OECD paper found a "causal impact" of the EU ETS on emissions reduction, one of statistically significant stature. "Most of the reduction", the OECD paper confirms, was achieved since Phase II of the ETS began in 2008. Notably, the authors say:

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[105] European Commission. "2050 Long-Term Strategy." *Climate Action - European Commission*, European Commission, 16 Feb. 2017, https://ec.europa.eu/clima/policies/strategies/2050_en.
[106] ibid
[107] Dechezleprêtre, A., D. Nachtigall and F. Venmans (2018), "The joint impact of the European Union emissions trading system on carbon emissions and economic performance", *OECD Economics Department Working Papers*, No. 1515, OECD Publishing, Paris, https://doi.org/10.1787/4819b016-en.

> *"We also find that allocating free emissions allowances significantly reduces the treatment effect. Our results suggest emissions would have declined by around 25% if only half the allowances would have been freely distributed."*[108]

The outlook for the EU ETS is undoubtedly positive. The goals of simultaneous steady emissions reduction and market stability have now been achieved, and the emissions market is a successful model for others elsewhere. Phase IV has not yet begun, and will officially do so in 2021, after Phase III's conclusion. It will run through the end of 2028, though the European Commission intends to conduct a mid-term evaluation by 2026.[109] The structural changes that led to the satisfactory performance of the third phase will be retained, but a number of additional features will be appended to the ETS, agreed upon in 2014 by the European Council.[110] First (and most politically controversial), the linear reduction factor (or LRF) that forms the core operating formula for the EU-wide emissions cap will be increased significantly, from 1.74% per year to 2.2% per year. By 2030, it is hoped, this increased LRF will have cut EU greenhouse gas emissions by 43% relative to 2005.[111]

In addition, the Council determined that 12% of verified annual emissions during Phase IV would be placed into an "automatic set-aside reserve mechanism", essentially creating a carbon floor price.[112] It is hoped that by creating such a floor price – which, if reached by the market, would effectively function as a carbon tax within the emissions trading system – the market failures of the first two phases that resulted in such low prices can be avoided, and the incentives of the emissions trading scheme upheld.[113] Finally, the Commission made a further recommendation that the EU ETS be "link[ed] up with compatible systems around the world to form the backbone of a global carbon market"[114],

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[108] ibid
[109] European Commission. "Revision for Phase 4 (2021-2030)." *Climate Action - European Commission*, 16 Feb. 2017, https://ec.europa.eu/clima/policies/ets/revision_en.
[110] European Council. "Letter by President of the European Council Herman Van Rompuy to the members of the European Council". 20 Jan. 2014, https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/140671.pdf.
[111] European Commission. "Revision for Phase 4 (2021-2030)." *Climate Action - European Commission*, 16 Feb. 2017, https://ec.europa.eu/clima/policies/ets/revision_en.
[112] ibid
[113] Haites, Erik, et al. "Experience with Carbon Taxes and Greenhouse Gas Emissions Trading Systems." *SSRN Electronic Journal*, 2018, scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1358&context=delpf, 10.2139/ssrn.3119241. Accessed 6 Aug. 2019.
[114] European Commission. "International Carbon Market." *Climate Action - European Commission*, European Commission, 16 Feb. 2017, https://ec.europa.eu/clima/policies/ets/markets_en.

should the international political opportunity for such a market arise. Although most of these reforms would not take effect until the formal beginning of Phase IV, the carbon price floor mechanism was deemed important enough to push back into the later years of Phase III. Consequently, the price floor mechanism will tentatively be deployed at the end of 2019.[115]

There are areas where the European Union's campaign to reduce emissions may be further expanded, both as extensions to the EU ETS and as supplementary or complementary policy initiatives. One such proposal that has been discussed at the Commission level is the hypothetical implementation of a carbon border tax or tariff. Such a tariff would be designed to apply costs to goods produced abroad in the absence of a carbon tax or emissions trading system (and have therefore not been "charged" the costs of the emissions created in their production). Policy of this kind would achieve two main purposes. First, it would directly cut off the ability of European or overseas emitters to avoid the costs of emissions that might be applied within the EU ETS by relying on production abroad, where such costs are not applied. Secondly, a carbon border tariff would level the market for emitters that *do* participate wholesale in the EU ETS without offshoring production, and prevent price undercutting at those firms' expense.[116] Another, less direct consequence that could prove nevertheless useful to the European Union in a political sense would be the application of significant pressure on countries like the United States and Brazil, who choose not to uphold international climate change and emissions abatement agreements.

V. The Chinese ETS

Any analysis of China's energy and climate policy should be prefaced by some important points. Most importantly, China has been since 2006 the world's most prolific

[115] European Parliament "Parliament Adopts CO2 Market Stability Reserve: News: European Parliament." *Parliament Adopts CO2 Market Stability Reserve | News | European Parliament*, 8 July 2015, http://www.europarl.europa.eu/news/en/press-room/20150703IPR73913/parliament-adopts-co2-market-stability-reserve.

[116] Derviş, Kemal, and Sebastian Strauss. "The Real Obstacle to Climate Action." *Brookings*, Brookings, 21 Aug. 2019, https://www.brookings.edu/opinions/the-real-obstacle-to-climate-action/.

polluter, emitting 9.84 billion tons of greenhouse gases in 2017 alone.[117] It is unlikely that any other country will challenge China for this unfortunate distinction until at least 2030, after which time China has pledged to reduce its emissions under the terms of the Paris Agreement. In the meantime, its reductions will be tied to domestic endeavors centered on Beijing's efforts to increase carbon efficiency, and policy intended to make use of the Chinese mixed economy.

China's emissions impact does not end at its borders, either. As part of its "Belt and Road Initiative" bid to extend economic and political influence globally, and across Africa and Asia in particular, China and Chinese-sponsored multinational corporations have invested billions of dollars in overseas industrial development projects. 70 countries have signed onto the initiative, accepting Chinese financing for infrastructure development of all kinds, including power plants, since the program's launch in 2013.[118] No restrictions are placed on these projects concerning emissions regulation, efficiency ratings, or local area impact by the investors. Much like China, which was able to swiftly industrialize huge portions of its economy, but at the cost of a doubling in greenhouse gas emissions, governments of participating countries are often willing to stomach such consequences in order to pursue more developed economies. According to economist Nicholas Stern, these Belt and Road Initiative member countries – whose collective average GDP per capita is less than half that of China's – would tip the goals of the Paris Agreement into impossibility should they develop at the pace China did during the period from 2000-2010.[119] Consequently, the emissions footprint of the People's Republic tallies to a figure far beyond its already-significant domestic production.

Even if China and its Belt and Road Initiative partner countries are able to achieve their desired industrialization goals without the anticipated colossal consequences to global emissions, the process by which China extends its global infrastructure network to include them will itself be the source of a massive increase to emissions. As of 2019, 240 "coal projects" across 25 countries are being constructed by Chinese companies; the vast majority

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[117] Ritchie, Hannah, and Max Roser. "CO_2 and Greenhouse Gas Emissions." *Our World in Data*, 11 May 2017, https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions.
[118] Hilton, Isabel. *How China's Big Overseas Initiative Threatens Global Climate Progress*, Yale Environment 360, 3 Jan. 2019, https://e360.yale.edu/features/how-chinas-big-overseas-initiative-threatens-climate-progress.
[119] ibid

of these endeavors involve no carbon capture technology whatsoever.[120] Combined with the necessity of constructing vast new webs of transportation infrastructure in every one of the Belt and Road initiative countries, China is in a sense exporting carbon emissions overseas for its own commercial, political, and geostrategic interests.

Additionally, Chinese political priorities, as first expressed by Hu Jintao and the ruling Communist Party, are focused on facilitating what the CPC terms China's "peaceful rise"[121] into global prominence, powered by the world's largest industrial economy. This goal is not necessarily incompatible with the shared global goal of emissions reduction, but it does place green energy politics in a precarious political position. With the goal of Chinese mass industrialization (and eventually, Beijing hopes, incontrovertible Great Power status) coming first, only policies that do not prove impediments to the long-term strategies that lead there are permissible. This unspoken restriction applies across all disciplines and affects all policymaking. In emissions trading, however, the constraints become particularly clear. The slow-motion rollout and repeated delays of China's carbon market infrastructure demonstrate this amply, as does China's refusal to commit to net emissions reductions in the Paris Climate Agreement.[122] Instead of flat emissions reductions, China has opted to commit to reductions in emissions intensity, a far more nebulous and hard-to-verify measurement that records "the level of greenhouse gas emissions per unit of economic activity".[123] Conveniently for China, this means that the country can make such a far-off commitment to begin reducing emissions only after 2030, and that the already-beginning slowdown of growth in the Chinese economy[124] will make emissions intensity thresholds more attainable, where net reduction goals might be more difficult or costly.

The above criticisms aside, China's goals for its emissions trading system are in line with its commitment under the 2015 Paris Agreement on climate change. It intends to reduce carbon intensity by 40 to

[120] ibid
[121] PAN Chengxin (2009): "Peaceful Rise and China's new international contract: the state in change in transnational society", in CHELAN LI, Linda: "The Chinese State in Transition, Processes and contests in local China", Routledge Studies on China in Transition, p. 129
[122] "Assessing the Policy Gaps for Achieving China's Climate Targets in the Paris Agreement." *The Fletcher School*, Tufts University, https://fletcher.tufts.edu/news-events/news/assessing-policy-gaps-achieving-chinas-climate-targets-paris-agreement.
[123] Ruff, Lyndon, and Alasdair Bruce. "Carbon Intensity API." *Carbon Intensity*, https://carbonintensity.org.uk/.
[124] "China's Economic Slowdown: How Worried Should We Be?" *BBC News*, BBC, 4 Jan. 2019, https://www.bbc.com/news/business-46755158.

45 percent (relative to 2005 levels) by 2020, and to achieve peak emissions by 2030. It covers eight sectors of the Chinese economy, mostly related to industrial emissions[125]:

- Aviation – unlike the European ETS, China's in-progress National ETS will include aviation emissions from the beginning. Given China's prior hostility to including aviation emissions in the European emissions market, it remains unclear how China's policy shift in this area will affect the aviation industry globally and China's interaction with the EU ETS.
- Building materials
- Chemicals
- Iron and steel
- Non-ferrous metals
- Paper making
- Petrochemicals
- Power

VI. China's ETS – Performance and Outlook

It remains challenging, at the current juncture, to fairly evaluate the performance of China's energy market scheme. For one, the scheme has not yet been fully implemented, and making judgements about its sum effects would be entirely premature. The characteristics, configurations, and results of the small-scale pilot emissions markets that have been implemented are well documented, however. Consequently, this section will focus on evaluation of the collection of experimental emissions trading systems that the Communist Party has collectively dubbed the Low Carbon Development Pilot Program.[126] Though Western documentation on these smaller schemes is limited, there are a few well-researched papers from both Chinese government-aligned and independent Chinese scholars, many of the latter in collaboration with American universities.

We can evaluate the Chinese approach to emissions trading policy based on its

[125] *China National ETS - International Carbon Action Partnership*. International Carbon Action Partnership, 9 Apr. 2019, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=55.
[126] Wang, Chen, et al. "Overview of Research on Chinas Transition to Low-Carbon Development: The Role of Cities, Technologies, Industries and the Energy System." *Renewable and Sustainable Energy Reviews*, vol. 81, 2018, pp. 1350–1364., doi:10.1016/j.rser.2017.05.099.

rollout in prefecture-level cities throughout the country, and the performance of its experimental emissions trading scheme in the variety of configurations these provincial implementations have been arrayed. Approval of the experimental system in 2011 by the Chinese government's National Development and Reform Commission, or NDRC, took place in order to prepare Chinese national institutions for emissions trading, since no similar endeavor had been undertaken in the country before.[127] China has established eight emissions markets in seven cities, each with different trading periods, different industrial sector coverage, and different mechanisms for allowance distribution. Additionally, each of the so-called "pilot programs" was permitted to configure the fundamental design mechanisms for its specific emissions market scheme; according to Prof. ZhongXiang Zhang of Fudan University's School of Economics, this relative institutional freedom led to different approaches to transactions, price uncertainty, and managing risk.[128]

The cities that participated in the pilot emissions trading schemes were selected in order to reflect the diversity of economic, political, social, and industrial character of a vast and populous country like China.[129] In chronological order of start date, they are:

- Shenzhen, whose pilot market was launched in June 2013. Shenzhen was selected both for its large urban population – more than twelve million people, roughly that of Belgium – and unique characteristics of its political configuration. Directly adjacent to the autonomous regions of Hong Kong and Macau, Shenzhen is a designated "Special Economic Zone", permitted more than other areas of the country to engage in free market and investment-driven economics at the policy level. Specifically, in Special Economic Zones, the Chinese central government is not required to approve business activities of either a domestic or international nature, nor to organize the economic systems around which those transactions take place.[130] Shenzhen was chosen for an emissions trading pilot in order to test the effectiveness in order to test such a system in the People Republic's

[127] Parenteau, Patrick, and Mingde Cao. *Carbon Trading in China: Progress and Challenges*. 2016.
[128] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.
[129] ibid
[130] Zeng, Douglas. *China's Special Economic Zones and Industrial Clusters: Success and Challenges*. 2012.

closest extant equivalent to a free market system (Hong Kong and Macau excluded).

- Shanghai, whose pilot market was launched in November 2013. Shanghai, the financial center of China, is the most populous urban area in the country, with more than twenty-six million people. The city hosts the busiest port in the world and as well as the Shanghai Futures Exchange, which competes with Hong Kong and Singapore for preeminence in East Asian finance. Shanghai was selected for an emissions trading pilot in order to observe the interaction of emissions trading with strong local financial markets already in place. Shanghai is one of four cities ("Municipalities", in official language) in China directly under the control of the central government, and as such effectively exists as a province-level entity. All four participated in the experimental pilot market schemes.
- Beijing, whose pilot market was launched in November 2013. Like Shanghai, Beijing is a Municipality, and blurs the line between province and city. As the capital of China, it is a hub for political activity and an administrative center. Beijing therefore needed no particular justification for selection as a pilot for an emissions trading system.
- Guangdong province, whose pilot market was launched in December 2013. Guangdong is a province, not a city, and in fact includes the city of Shenzhen, which (as earlier noted) also began an emissions market pilot program of its own. Because Shenzhen exists in its own Special Economic Zone, Guangdong's pilot market exists separately from that of Shenzhen. The province is one of the most populous subnational divisions in the world, with more than 113 million people, making it larger by several million people than any single European country, even without Shenzhen.[131] Guangdong is notable in China, and in general, for being a major manufacturing center. The province was chosen for a pilot emissions trading program in order to test performance in a region reliant on heavy manufacturing activity for its local economic health.

[131] "National Data". National Bureau of Statistics of China. 6 March 2015. Archived from the original on 19 April 2016.

- Tianjin, whose pilot market was also launched in December 2013. A Municipality beholden directly to the central government, Tianjin is a significant center of industry, and a major port city. It, like Chongqing, was chosen for a pilot emissions trading program in order to test interactions between emissions trading systems and the functions of a heavily industrial local economy that produces a great deal of emissions.
- Hubei province, whose pilot market was launched in April 2014. Being a province, like Guangdong, rather than a single city, Hubei contains a number of smaller political entities of both urban and rural nature. Its population is roughly equal to that of Italy (60 million people). Wuhan, the capital city of Hubei, is a noteworthy center of iron and steel production, and a disproportionately large emitter of greenhouse gases.
- Chongqing, whose pilot market was launched in June 2014. Much like Tianjin, Chongqing is both a Municipality of China and a major industrial center, though it is notable in and of itself as a nearly province-sized entity, both in terms of land area (roughly the size of Austria) and population. Nearly 30 million people live in Chongqing, making it the most populous city in China's western interior. Chongqing was selected for a pilot emissions trading program much for the same reasons as Tianjin, though the additional consideration of its uniquely prominent stature in China's interior surely played a role in its selection as well.

Though it was not one of the original seven cities or provinces selected for an experimental emissions trading system, China permitted an additional test market to be launched:

- Fujian province, whose pilot market was launched in September 2016. Unlike the other pilot locations, Fujian is not known for any particular political, administrative, or economic distinction, but is instead a rather

> diverse province including urban areas (some, like Quanzhou and Fuzhou, of significant size), semi-urban industrial areas, and rural areas.[132]

Zhang's paper (which was published in 2015, thus preceding the Fujian pilot's approval and launch) notes that the various pilot zones were chosen specifically in order to take advantage of disparate regional and urban characteristics that might prove conducive to the efficacy of emissions market performance. With each of the eight political entities above permitted to organize its emissions trading system on particular, regionally-appropriate lines, it was hoped that certain observable trends might become apparent across these vastly dissimilar markets – trends that could, with careful policy application, ultimately serve to strengthen a national-level emissions trading system.[133]

These regional and metropolitan emissions markets ultimately diverged significantly in policy implementation without prodding from the central government. China's (self-described) status as a market economy that is not yet fully "mature", as it remains in the process of shifting away from central planning, played a role in these institutional design considerations (excepting, to some degree, Shenzhen). In recognition of this designation, the Chinese pilot emissions markets implemented their schemes without explicit modelling upon any foreign system, European or otherwise. Zhang notes that China's government acknowledged in the post-2010 years of energy policy re-evaluation that central planning "administrative measures" as the primary means of emissions reduction are "effective, but not efficient". Assessment of market forces' ability to create positive outcomes in this regard, therefore, was deemed a priority, and noted in especial focus in the Third Plenum of the 18th Central Committee to "assign the market a decisive role in allocating resources".[134] While this decree is ultimately relevant to entire swathes of the Chinese economic system, it is notable in particular for emissions trading because it illustrates the gradual shift in approach undertaken by the Chinese government in its approach to managing problems involving externalities – like that of greenhouse gas emissions.

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[132] International Carbon Action Partnership. *Emissions Trading Worldwide International Carbon Action Partnership (ICAP) Status Report 2017*. 2017.
[133] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.
[134] ibid

Preeminent among the government's concerns was ensuring appropriate pricing.[135] Unlike the European Union, whose members operate as autonomous economies somewhat collectivized by monetary union and initiatives undertaken by the European Commission and Parliament, China is a single economy, with a single fiscal policy, alone in gross domestic product nearly matching that of the European Union. For this reason, a potential failure in developing emissions pricing could have a much more damaging blowback effect on China's emissions market system than it would on the EU ETS, contained as such economic effects could be to single countries in the latter. The failure of EU ETS' Phase I serves as an example of such a policy failure that the Communist Party sought to avoid, and for which the pilot emissions market program was designed to preempt and avoid via experimental policy measures.

The seven original pilot schemes shared a few guiding conditions. For one, all seven had the same initial market period, from 2013 to 2015. Also notable was the condition of the emissions coverage mechanism; in order to prioritize development, deployment, and evaluation of policy on a specific target, only carbon dioxide would be monitored and traded by the regional and metropolitan pilot schemes.[136] Another distinction shared by all the Chinese pilot market schemes is the method by which emissions are accounted for. In the European ETS structure, and in most other emissions trading monitoring systems worldwide, the tracking of emissions occurs directly at "targeted installations", generally facilities such as factories, mines, or power plants where the bulk of greenhouse gas emissions take place. China's systems, however, make these recordings in a different fashion: all trackable emissions, regardless of specific source, are covered by the Chinese pilot systems.[137] Additionally, the pilot mechanisms include generated emissions that are considered "indirect", generally those that contribute to the economy of a region, but are actually emitted elsewhere.[138] The European Union's ETS does not do this. The reasoning for China's pilot systems to track indirect emissions is twofold. For one, the

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[135] ibid

[136] International Carbon Action Partnership. *Emissions Trading Worldwide International Carbon Action Partnership (ICAP) Status Report 2017*. 2017.

[137] Chen, Xing, and Jintao Xu. "Carbon Trading Scheme in the People's Republic of China: Evaluating the Performance of Seven Pilot Projects." *Asian Development Review*, vol. 35, no. 2, Aug. 2018, pp. 131–152, 10.1162/adev_a_00117. Accessed 19 Aug. 2019.

[138] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.

interconnectedness of the Chinese economy across administrative metropolitan or provincial boundaries makes it necessary to include indirect emissions or risk entire swathes of a regional economy falling outside the scope of the emissions market entirely. Zhang gives the example of Beijing, which imports 60% or more of its power generation from other regions of the country, which would lie outside Beijing's emissions trading market scheme if left distinct.[139] Secondly, the inclusion of indirect emissions is intended to reduce so-called "carbon leakage" within the country, wherein covered entities might attempt to shift emissions outside the zone of the market mechanism (in this case, elsewhere within China) in order to avoid the costs associated with the market mechanism without the intervention of the overseeing entity.[140] This behavior can also manifest in terms of sector shift; for example, should an emitter find that one type of greenhouse gas emissions are monitored or priced to a degree lower than that which the emitter currently produces, that emitter might find it profitable to shift from one form of greenhouse gas emissions to another, without reducing its net output. By covering both direct and indirect emissions, and monitoring all emissions without regard to specific point of origin, the Chinese pilot schemes were intended to reduce such leakages and inefficiencies in the market mechanisms.

All the pilot systems shared a similar approach to allowance holding. The so-called practice of "banking" allowances – keeping certificates from one year to the next – was permitted, but 2015 was designated a finite cut-off point, by which allowances were required to be used or lost. Additionally, the government prohibited borrowing funds in order to purchase allowances on the market mechanism. Finally, every pilot emissions market system was required to make use of the same standardized monitoring units: Chinese Certified Emission Reductions, or CCERs. These units, which were designed in order to maximize efficiency of central government policy comparison and evaluation, include provisions for specificity of emissions recording applicable to any sector or industry.[141] The Chinese Certified Emissions Reductions units are a framework built upon

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[139] ibid

[140] Swartz, Jeff. *Global Economic Policy and Institutions China's National Emissions Trading System Implications for Carbon Markets and Trade International Emissions Trading Association (IETA) ICTSD Global Platform on Climate Change, Trade and Sustainable Energy*. 2016.

[141] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.

the Flexible Mechanisms of the Kyoto Protocol, mentioned previously in section IV of this paper. Specifically, the CCERS make use of the Clean Development Mechanism (CDM), under which industrialized (Annex I and II category) countries can purchase certificates to invest funds abroad – in industrializing or developing (Annex B or Least-Developed) countries – specifically in clean development. China is a major recipient of these investments[142], as an Annex B country, making harmonization of the CDM system with local emissions trading schemes an important element of the policy framework for their institutional design. In fact, China represents the largest source of Clean Development Mechanism credits of any signatory to the United Nations Framework on Climate Change, more than the rest of the world combined. Besides these common features outlined above, China's province- and city-specific pilot emissions trading programs developed vastly divergent approaches to policy. In their 2018 paper "China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions", Professors Yifei Zhang, Jonathan Harris, and Jin Li of Tufts University and the Shanghai Environment and Energy Exchange argue that the seven pilot systems' institutional designs represent seven ways of approaching and implementing the so-called "Two Mountain Theory", as proposed by President Xi Jinping in 2016.[143] The Two Mountain Theory, in principle, is the idea that economic means should supplement ecological means – and vice versa – in combating and preventing damage to the Chinese environment[144]. This acknowledgement of the role of development was repeated in the official record of the 19th National Congress of the Communist Party, in which officials at all levels of government were encouraged to prioritize "development, poverty alleviation, and environmental protection" together, rather than as separate endeavors.[145]

The process of allocating quotas was one such ETS function that both varied amongst the pilot market participants and served to apply the multiple focuses (development and ecological interest) of Xi and the Communist Party. All of the eight pilot

[142] United Nations Framework Convention on Climate Change. "CDM: CDM Insights - Intelligence about the CDM at the End of Each Month." *Unfccc.Int*, 2019, cdm.unfccc.int/Statistics/Public/CDMinsights/index.html. Accessed 27 Aug. 2019.
[143] Zhang, Yifei, et al. *China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions*. 2018.
[144] Xiang-chao, Pan. (2018). The Theoretical Innovation and Practical Significance of The Theory about "Two Mountains" by Xi Jinping. IOP Conference Series: Earth and Environmental Science. 199. 022047. 10.1088/1755-1315/199/2/022047.
[145] Zhang, Yifei, et al. *China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions*. 2018.

emissions trading schemes used some degree of free allocation, and in most free allocation remained the sole form of allocation.[146] In these, combinations of grandfathering-based allocation and benchmarking were generally used, though with different setups for each. Chongqing, for example, established its free allocation entirely via grandfathering, with allocation tied to the highest recorded emissions over the four years prior to the rollout of the pilot scheme. Zhang writes that this was to "reduce the effect of 'whipping the fast ox' to the extent possible" – i.e., to avoid disproportionately applying cost to emitters that had already begun to make themselves more efficient. Shanghai extended this consideration even further, allowing emitters to earn rewards "for having taken actions for energy-saving technical transformation or energy performance over the period 2006-11", and setting these rewards at a full 30% of the total revenue from the pilot emissions market scheme.[147]

Though all of the pilot systems make use of free allocation, Guangdong and Shenzhen developed unique ways of distributing said allocation. In Shenzhen, the pilot authority created a "competitive game-based allocation of allowances in one given sector." From Zhang:

> *"The key game rules are defined as follows. First, the emissions cap of a given sector is set. Second, all regulated entities in one given sector are informed about historical and target intensity benchmarks of that sector. Third, each regulated entity submits its emissions allowance demand and projected output to compete with other entities in the same sector for free allowances. Fourth, historically more carbon-intensive entities are required to achieve more reductions and at the same time, entities whose existing carbon intensities are low are encouraged for [sic] large reduction. In each round of the game, one entity can choose to accept allowances and exit the game provided that it is satisfied with its allocation. If not, it can choose to continue to compete for allowances in the next round of game. As the sector cap is set, allowances allocated to those satisfied entities in this round of*

[146] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.
[147] ibid

> *game [are] deducted and thus allowances available for the remaining rounds will decrease as the game repeats."*[148]

Guangdong did not attempt such an audaciously experimental method, but it did run an equally novel allocation system. In Guangdong's pilot system, emitters were granted ninety-seven percent of emissions allocation for free according to standard methods, but were required to purchase 3% via auction. This would be a fairly standard arrangement, if not for the additional requirement that the emitters must purchase the 3% of auctioned certificates *before* being granted their free allocations. The 3% figure was then increased to 10% in 2015. "The Guangdong pilot", Zhang says, "would make these enterprises directly feel the cost of emissions" first, partially in order to double check that the state's understanding of emissions demand was accurate, and partially in order to directly levy cost unto the emitter as is typical in the auction scheme.[149] By placing the auction first in the process, before allocation took place, Guangdong forced its emitters to choose between cost of guaranteed (auctioned) certificates, or risk suboptimal free allocations if the auction was ignored.

Beijing and Tianjin combined historical emissions and carbon intensity with an evaluation of benchmarks derived from industrial record-keeping. Shanghai did much the same as these two cities, but replaced the consideration regarding carbon intensity with a "early abatement incentive", as well as the extendable baseline year mentioned earlier. The two provinces, Guangdong and Hubei, configured their pilot systems much the same fashion, minus the early abatement incentive. Shenzhen used the aforementioned competitive game to allocate its initial allocation packages, then industrial benchmarking for the remainder. Chongqing, finally, elected not to involve the allocation authority at all in the process of distribution, instead providing allocations completely according to the requested number of certificates requested by the covered emitters.[150]

Policy varied further across the seven (later eight) pilots. Coverage, for example, was established via tonnage, and each pilot emissions market system maintained its own threshold for inclusion. In Shanghai, which had the lowest such threshold, fifty-seven percent of emissions in the administrative region were included. (For comparison, the EU

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[148] ibid
[149] ibid
[150] International Carbon Action Partnership. *Emissions Trading Worldwide International Carbon Action Partnership (ICAP) Status Report 2017*. 2017.

Emissions Trading System covers roughly forty-nine percent of participating state emissions.) But on the low end, Hubei's pilot system only covered thirty-six percent of emissions.[151] To a certain extent, this is an expected outcome; Shanghai is a highly urban, highly developed, mostly post-industrial city-region, while Hubei is a center of industry that is heavily industrialized. This disparity, however, highlights the difficulty of implementing emissions markets across divergent local economies such as between Shanghai and Hubei province, and minimizing the kinds of inefficiencies that could cause under-coverage in a region like Hubei or over-inclusion prompted by cities like Shanghai, that causes unintended economic disruption to more industrial and rural areas. Observing such outcomes, divergent as they were, were precisely why the government of China insisted on establishing the pilot schemes before developing a nationwide scheme.

Additional considerations in the pilot schemes were given to other elements of the market system, including those outside the direct control of the systems' institutional designs and their monitoring authorities. For example, in regions or cities where a single steel company is dominant, authorities wished to avoid market dominance of a single player, which could then influence prices disproportionately, or even exert influence over the allocation process. To counter this potential outcome, many of the pilot schemes established maximum quotas or bid percentages. In Beijing, auctions restricted emitters to purchasing no more than fifteen percent of the total allowances for sale. Others approached the issue from a more granular angle; in Shanghai, firm-to-firm transactions above one hundred thousand tons' worth of allowances must be accomplished via negotiations involving the market at large.[152] In each of the pilot ETS schemes, the allocation authorities also established a system of reserve allocations, to supplement the primary allocation mechanisms described above.

The success or failure of China's emissions trading ambitions will undoubtedly depend to a great extent on its institutional design choices, both in the rollout period and in the long term. But there are further considerations distinct from institutional design that are also worth noting, as they are unique to China and contrast with prior attempts by Western democratic governments to attempt emissions trading system implementation. Most

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[151] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.
[152] ibid

important of these will be the willingness of the ruling Communist Party of China to commit to emissions trading – and by extension, to the principles of free markets – as a tool applied to the economy at large. While China's government has made steps since the Deng Xiaoping government of the 1980s to shift its command economy towards something more resembling market economics (most famously articulated by Deng's government as "Socialism with Chinese Characteristics"[153]) it has resolutely avoided making parallel shifts towards democratization. As such, Chinese policy-makers exert a great deal of political power while being free, to a certain extent, from popular accountability. In some senses, this presents opportunities for China to proactively pursue any of a variety of wide-ranging economic policy choices.

However, Chinese authoritarianism should not be construed as some kind of unambiguously positive advantage to policy development, or to the implementation of carbon trading systems in particular, compared to the European Union or other democratic societies. While it is true that China has the ability to forcefully implement policy or quickly transition between economic incentive schemes more swiftly than would be possible in a democratic country, it faces some significant shortcomings when it comes to policy development. Democracies, and the people who lead them, are fundamentally accountable to both voters and to private interests in ways that strongly incentivize not just political viability, but policy effectiveness. In China, leadership is not accountable to the citizenry, and while private interests do play a significant and sometimes powerful role in the Chinese system, the line between private interests and the state itself is frequently blurred. To be clear: built-in democratic features of accountable government do not necessarily ensure good policy, especially given that populist political choices can result in clashing priorities of government. Where emissions trading is concerned, this collision of government priorities becomes especially relevant. But there is a fundamental advantage held by systems that receive constant pressure from affected parties on all levels of the political sphere in the form of lobbying, public policy debate, and verifiable economic status updates. In China, the government must shape its policy priorities in response to internal Communist Party concerns and priorities, but is notably removed from the kinds of decision-making incentives that strengthen policy in democracies.

[153] Gabriel, Satya J. "Technological Determinism & Socialism with Chinese Characteristics." *Mtholyoke.Edu*, 2019, www.mtholyoke.edu/courses/sgabriel/economics/china-essays/8.html. Accessed 17 Aug. 2019.

In 2017, researchers from Wuhan University, Tsinghua University Shenzhen, and the University of California at Berkeley published "The Allowance Mechanism of China's Carbon Trading Pilots: A Comparative Analysis with Schemes in the EU and California", in which they made a number of recommendations for "courses of action to strengthen China's existing [emissions trading] pilots and to build valuable experiences for the national cap-and-trade system in China".[154] Primarily, they argue that the pilot emissions trading schemes over-allocated emissions certificates, much like the European Union's ETS did during its Phase I. According to the researchers, China's "significant economic slowdown" since 2013 meant that the figures upon which allocations were grandfathered or distributed were based on data that was no longer aligned with GDP growth. Over time, the sectors included in the emissions market pilots saw "a clear downward trend of [their] production value growth rates" – not as a consequence of participation in the carbon market, but as a result of shifts in the Chinese economy as a whole. The Hubei pilot market system, it is noted, took care to make use of a "dynamic adjustment measure" that could respond to over-allocation of emissions certificates. In the words of the Berkeley paper researchers:

> *"This measure allows the program administrator to take back the enterprise's allowances surplus resulting from a sharp drop in production, and cancel the allowances in the government reserve and the new entrants reserve which cannot be distributed until the compliance date, and further reduce the total allowances of the entry year."*[155]

This mechanism, it would seem, gives the allocation authority tools to respond to the effects of over-allocation caused by drawing-down of production in Chinese industries, whether the result of slowed GDP growth or other factors.

The researchers also note the persistence of the problem effect mentioned earlier: that of "whipping the fast ox".[156] Because all of the pilot systems used grandfathering of

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[154] Xiong, Ling, et al. "The Allowance Mechanism of China's Carbon Trading Pilots: A Comparative Analysis with Schemes in EU and California." *Applied Energy*, vol. 185, Jan. 2017, pp. 1849–1859, china.lbl.gov/sites/default/files/apen-d-15-04712r1-1.pdf, 10.1016/j.apenergy.2016.01.064. Accessed 27 Aug. 2019.

[155] ibid

[156] Zhang, Zhongxiang. *Crawford School of Public Policy Centre for Climate Economic & Policy Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme CCEP Working Paper 1503 April 2015*. 2015.

free allocations to some degree, the effect of inadvertent penalization was in turn apparent across all the pilot systems, even in Chongqing, where specific measures had been taken to prevent such an outcome. Unfortunately, it seems difficult to prevent this effect when making use of grandfathered allocation; should free allocation take place, and emitters have taken prior steps towards abatement, some level of inadvertent penalization seems to be inherent to the process. Fortunately, this effect only takes place a single time (when the emissions market system is first established), but given the penalization effects that directly contradict the intended incentives of the emissions market, it is a problem worth addressing. The Berkeley paper's research group makes the recommendation that Chinese emissions trading schemes should set up award systems like those in place in the Chongqing pilot system in order to minimize the "whipping the fast ox" problem, or, instead, to use what they call an "adjustment factor", a "decreasing function of the covered entity's recent emission growth." [157]Most importantly, though, the scholars recommend that China abandon grandfathering emissions certificate allocations throughout its emissions market systems and convert all such allocation to a benchmarking approach "that more accurately reflects the actual intensity and to award credits for businesses that have taken actions."[158]

Allocation, however, was not the only major issue to surface during the Chinese pilot emissions trading schemes' operative periods. Another highlighted by the researchers in the Berkeley paper was the problem of duplicate record-keeping, or "double-counting" emissions. Since the pilot market systems ambitiously sought to include the entirety of emissions for their covered sectors, a great deal of double-counting took place. In the electricity sector, for example, both producer installations and their customers were made to purchase certificates for emissions. The researchers suggest two alternative approaches that might prevent this issue. Firstly, the Chinese emissions markets could imitate their counterparts in the EU ETS and restrict coverage only to primary emitters (i.e. the power generation facilities in the electricity example. Alternatively, the allocation authority can devise a system wherein certificates are distributed in such a way as to "divide the

[157] Xiong, Ling, et al. "The Allowance Mechanism of China's Carbon Trading Pilots: A Comparative Analysis with Schemes in EU and California." *Applied Energy*, vol. 185, Jan. 2017, pp. 1849–1859, china.lbl.gov/sites/default/files/apen-d-15-04712r1-1.pdf, 10.1016/j.apenergy.2016.01.064. Accessed 27 Aug. 2019.
[158] ibid

responsibility between the source of generation and the source of use and allocate allowances according to the shared responsibility among the power producers, distribution companies, and end consumers. Either solution would be an improvement on the original configurations, which resulted in significant inefficiency.

Other methods of improvement that might be implemented include restructuring the benchmarking process (both to make it more effective and to compensate for the inefficiencies of the free allocation process, should it continue to be used), and re-evaluating the approach towards allocation in the first place, potentially to include auctioning. Both Zhang and the Berkeley researchers advocate for a shift towards a more auctions-focused method of emissions certificate distribution. In the words of the latter paper:

"...free allocation will lead to reduced efficiency for China's carbon trade pilots and increased abatement cost due to the lack of enterprises' motivation for innovation. Also, the free allocation cannot provide and effective means for the government to obtain necessary revenue to support public and community programs in reducing carbon emissions and decarbonizing the energy system."[159]

"Distributing the allowances through competitive auction", the researchers go on to say, "can make enterprises truly realize the 'emissions cost', and fully reflect the principle of 'polluter pays'." This strident endorsement of auctioning as opposed to free allocation seems consistent with the findings of most researchers, both in the EU and in China, that grandfathered free allocation is a generally suboptimal method of emissions certificate allocation, relative to the alternatives mentioned earlier. Finally, the Berkeley paper concludes with the frequently-seen recommendation to uphold, enhance, and verify the ability of allocation authorities to monitor emitters to ensure accurate and timely data collection.

What, then, can we expect from China's nationwide emissions trading system? Some known factors:

[159] ibid

- The China national ETS was "politically launched" in December of 2017[160], though trading has not yet begun. Trading is set to begin in 2020; this date has been pushed back twice[161].
- The Chinese government's emissions trading "Work Plan" is designed in phases, much like it European Union counterpart. The first phase is intended to last "roughly one year", and "will focus on the development of market infrastructures", while the second and third phases are intended to gradually build the institutions required for simulation trading and spot trading, respectively[162].
- China intends its nationwide emissions market to cover roughly thirty percent of its national emissions at launch, equal to about three billion tons of carbon dioxide equivalent. The government intends to expand this figure over time, ahead of the planned emissions peak in 2030.[163]
- As was the case in the pilot schemes, China's national ETS will only include carbon dioxide at launch. Additionally, it will cover both direct and indirect emissions, but sets a threshold for inclusion at emitters producing more than 26,000 tons of emissions per year. Under these rules, about 1,700 entities will be subject to the emissions trading system's allocation structure, though this figure may change.

But there are a number of factors that remain more or less unknown. Most importantly, while Chinese emissions market operators have stated that they intend to make use of free allocation, the specific variety of free allocation to be used is unclear. ICAP reports that the allocation mechanism "is expected to be based on subsector benchmarks with ex-post adjustments for changes in actual production"[164], but there has been no firm guarantee of this from the ETS authorities. It seems likely, given the experiences of the

[160] *China National ETS - International Carbon Action Partnership*. International Carbon Action Partnership, 9 Apr. 2019, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=55
[161] Reuters Editorial. "UPDATE 1-China Expects First Trade in National Emissions Scheme in 2020." *U.S.*, Reuters, 30 Mar. 2019, www.reuters.com/article/climate-change-china/update-1-china-expects-first-trade-in-national-emissions-scheme-in-2020-idUSL3N21H02B. Accessed 20 Aug. 2019.
[162] *China National ETS - International Carbon Action Partnership*. International Carbon Action Partnership, 9 Apr. 2019, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=55
[163] ibid
[164] ibid

pilot emissions markets, that the Chinese government will avoid reliance on grandfathering, but it is difficult to say for certain ahead of time.

China's Ministry of Ecology and Environment published its "Interim Regulations on the Management of Carbon Emissions Trading" in April 2019. The paper discusses several aspects of the emissions trading system's institutional design, with a particular focus on its structures for monitoring, reporting, and verification. While the Ministry did not present any policy ideas of a particularly groundbreaking nature in this document, its detailed framework for enforcement makes it important to our understanding of the future Chinese ETS, once it has become active. Penalties have been legally set for emitters that violate the conditions of the emissions trading system or inaccurately report their emissions data, including both monetary fines and reduced credit scores. Additionally, emitters that fail to purchase enough emissions certificates to account for their annual output will be legally required to make up the difference in purchased certificates for the next year, even after the aforementioned penalties are applied. [165]

VII. Conclusion

The European Union and Chinese approaches to emissions trading are clearly distinct. Nevertheless, a number of important distinctions exist, particularly in regards to both systems' approach to allocations and sector coverage. These distinctions, and the relative degrees of success enjoyed by the EU's emissions market and the Chinese pilot systems, make a compelling argument for certain institutional design choices, and against others. For one, grandfathered allocation of free emissions allowances appears to be a less-than-optimal mechanism. While there are a good deal of arguments in favor of both allowance auctioning and benchmarking of free allocations, both methods – or a combination thereof – appear more effective than grandfathered allocation at producing the outcomes intended by the emissions market: incentivized emissions abatement, a fair distribution of cost (the "polluter pays" principle), and of course a generally well-functioning market system with appropriate pricing of emissions. The fact that researchers from China, the European Union, the United States, and Australia have all come to similar conclusions demonstrates the consistency of these findings.

[165] Chinese Ministry of Ecology and Environment. *Interim Regulations on the Management of Carbon Emissions Trading (Translated)*. Apr. 2019, fgs.mee.gov.cn/yfxzyfzzfjs/201904/W020190403600998752001.pdf. Accessed 23 Aug. 2019.

While the European Union appears to have already taken such lessons to policy, and shifted towards a significantly higher proportion of auctioned emissions allowances, it could still do more to minimize windfall profits and ensure social and economic fairness in its ETS system. For one, it may be wise to implement a carbon border tariff, primarily combat the negative market effects of an unbalanced international production market across several industries and sectors where some countries penalize emissions, while others do not. Even without these benefits, the diplomatic pressure thus applied to third parties without emissions abatement policies in place would go a long way towards enhancing the overall global goals of emissions reduction. Besides a carbon border tariff, the EU ETS could continue its push to use data-driven benchmarking for the proportion of allowances that it does not auction, and to phase out grandfathering entirely.

China's national emissions market has yet to begin trading, and questions still remain about its approach to free allocations, but it appears likely that the Chinese government will learn from the experiences of the eight pilot emissions market systems, and deploy some variation of the more nuanced approaches to emissions certificate allocation. This is a positive sign, as is China's hardline approach to emissions reporting violations by covered emitters. China must maintain such commitments to institutional strength in order to uphold a system that, if successful, will surpass the EU ETS to become the largest in the world. Unfortunately, the China National ETS will continue to use grandfathered emissions to allocate at least some of its certificates. With time, however, and the collection of larger amounts of data, the country might eventually shift towards a benchmarking-based system that responds proactively to changes in supply and demand to fairly allocate emissions, a change that would increase the efficiency of the allocations, should they still not be purchased at auction.

The nationwide Chinese ETS could do still more, especially in regards to its coverage. With China's emissions trading system only covering about thirty percent of its emissions, there still remains a significant amount of abatement that could take place, if more industries were included in the new system. This would likely require a number of policy changes, including a lowering of the annual emissions threshold for inclusion in the emissions market system, as well as an expansion of covered sectors in the Chinese economy. Fundamentally, though, the Communist Party's goal of beginning to decrease China's emissions only after 2030 handicaps all policy efforts in this field, and sends a

message that the priorities of China remain industrialization first, emissions abatement second. While China's participation in the Paris Climate Agreement is vital to the success of that international legislation, and China's engagement with the international community remains a critical piece of the international effort to fight climate change, China cannot rely on its emissions market alone – at least in its current configuration – to achieve its already-modest goals for emissions reduction. Further undermining this struggle is China's insistence on a casually negligent approach to international development, which prioritizes cheap energy production in the developing world and Beijing's geopolitical ambitions over the health of the world's atmosphere. Finally, committing only to reductions in emissions intensity, rather than emissions reduction (even with the modest 2030 goal) demonstrates a distinct lack of concern about the billions of tons of emissions that China produces as the single largest emitter of greenhouse gases in human history. It simply is not possible to achieve the goals of the Paris Agreement without a significant shift in policy from China.

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