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EMISSIONS TRADING ACROSS CHINA: INCORPORATING HONG KONG AND MACAU INTO AN URGENTLY NEEDED AIR POLLUTION CONTROL REGIME UNDER "ONE COUNTRY, TWO SYSTEMS"

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China's status as the world's largest sulfur dioxide emitter carries with it serious hazards to human and ecosystem health. The National People's Congress began to address this in 2000, when it promulgated national SO_2 emissions caps. By 2010, SO_2 emissions across the Mainland were supposed to stabilize at pre-set baselines. Rather than decreasing, however, emissions are reaching alarming new levels. China needs a more powerful mechanism, such as an emissions trading scheme (ETS), to achieve lower levels of emissions. The United States' Acid Rain Program provides an almost ideal model, but a unique variable is added when Hong Kong and Macau, the two Special Administrative Regions, are considered. Each region maintains exclusive jurisdiction over its own environmental policy under the constitutional matrix of "one country, two systems." Thus, a Chinese ETS incorporating the SARs would essentially operate in an international context. Hong Kong and neighboring Guangdong Province are negotiating a regional, transboundary ETS that could provide solutions, but the present conceptualization forming the basis for those negotiations is lacking in several critical regards and will likely prove ineffective. This article is novel in considering how to meaningfully encompass the SARs in an effective ETS framework. After an introduction to the issues, Part II establishes why ETS is necessary for China. Part III introduces the framework for environmental legislation in mainland China and the SARs, including the constitutional relationship between the SARs and other local governments in mainland China. Part IV will discuss the history of Chinese ETS pilot programs with a focus on lessons learned in Jiangsu Province. Part V analyzes the practical difficulties and shortcomings that have hampered other leading ETS regimes, highlighting the need for centralized authori-

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ty. Part VI evaluates current prospects for regional and national ETS, based upon an analysis of existing regulatory frameworks. Finally, Part VII concludes by recapping the recommendations, especially the need for a powerful supranational compliance and enforcement mechanism to manage long-term, transboundary, environmental policy.

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INTRODUCTION

Emissions trading schemes (ETS) are successfully abating pollution deposition around the world, but one is yet to be installed where it is most needed, China. Though Chinese provinces have been conducting ETS experiments for over a decade,[1] a national program reflecting China's awesome industrial power has yet to be conceived.[2] Undeterred, the Governments of the Hong Kong Special Administrative Region (HKSAR) and the People's Government of Guangdong Province are negotiating a separate ETS agreement to control sulfur dioxide (SO_2) pollution.[3] Their apparent willingness to adopt an air pollution partnership is promising, but may prove difficult to implement in the constitutional context of "one nation, two systems." ETS is relatively easy to install in closed constitutional systems, where a single authority holds ultimate logistical and enforcement power. For example, the United States' Acid Rain Program (U.S. ARP) provides an almost ideal template for an ETS within a unitary state with adequate legal and institu-

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1. The first local ETS scheme was adopted in Shanxi Province for Taiyuan City in 2001. At that time, formal experiments with SO_2 emissions trading was carried out in seven provinces and municipalities through one state-owned electricity-generating group. Since 2007, ETS has rapidly expanded throughout mainland China as more local legislation has been enacted and various trading markets established.Experiments were contemporaneously carried out in Jiangsu, Henan, and Shandong Provinces as well as Shanghai Municipality. Corresponding trading markets were established at Jiaxin City in Zhejiang Province, Wuhan City in Hubei Province, Beijing, and Shanghai. Moreover, an experiment became regional in the case of the Yangtzi River Delta Region, an area including Jiangsu Province, Zhejiang Province, and Shanghai Municipality. *See* Wang et al., *Paiwu Jiaoyi Zhidu de Zuixin Shijian yu Zhanwang* [The Latest Practice of Emission Trading System and Its Future], 10 ENVTL. ECON. 31, 31-45 (2008) (translated by author).

2. *Id.*

3. H.K. ENVTL PROTECTION DEP'T, IMPLEMENTATION FRAMEWORK OF THE EMISSION TRADING PILOT SCHEME FOR THERMAL POWER PLANTS IN THE PEARL RIVER DELTA REGION (THE PILOT SCHEME), *available at* http://www.epd.gov.hk/epd/english/action_blue_sky/files/PRD_emission_trading_eng.pdf.

Sulfur dioxide is, along with nitrogen oxide (NOx) and carbon compounds a precursor to acid rain. More accurately described as acid deposition, acid rain occurs when emissions of these pollutants react with water, oxygen and oxidants naturally occurring in the atmosphere. Their reaction results in the formation of toxic chemical compounds, most notably sulfuric and nitric acids, which then fall to the Earth's surface as either wet precipitation (rain or snow) or in a dry form (gases or particles). Once deposited, the acids damage human health, destroy land and water ecosystems, and visibly corrode automotive finishes, buildings, bridges and statues. *See* Robert A. Goyer et al., *Potential Human Health Effects of Acid Rain: Report of a Workshop*, 60 ENVTL. HEALTH PERSP. 355, 355-59 (1985), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1568541/pdf/envhper00443-0343.pdf; *see also* U.S. Environmental Protection Agency, Effects of Acid Rain – Human Health, http://www.epa.gov/acidrain/effects/health.html (last visited Apr. 18, 2010) [hereinafter Effects of Acid Rain – Human Health]; Anthony J. Hedley et al., *Air Pollution: Costs and Paths to a Solution in Hong Kong - Understanding the Connections Among Visibility, Air pollution, and Health Costs in Pursuit of Accountability*, 71 J. TOXICOLOGY & ENVTL. HEALTH 544 (2008) (further explaining the detrimental effects of SO_2 pollution on human, plant and animal life).

tional capacity. This article suggests that the U.S. ARP model could eventually be transplanted and effective within mainland China, if the political will to administer it exists. However, the unique constitutional standing of the HKSAR and its sister, the Macau SAR, introduce new variables into the traditional equation. Although they are part of China and defer to Beijing in some matters, the SARs maintain exclusive jurisdiction over domestic environmental legislation.[4] Therefore, a constitutional compromise must occur if the SARs are to be included in an effective ETS regime with either their neighboring provinces or China, in its entirety. This article addresses the issue of how to meaningfully incorporate the two Chinese SARs in a transboundary ETS program.

A number of legal, structural, and institutional flaws undermine the current conception of a nationwide Chinese ETS. In lieu of national action, the HKSAR and Guangdong continue to plan a regional ETS.[5] Though it has potential to provide solutions to the constitutional issue, that regime as presently conceptualized, suffers from several fatal flaws. First, the environmental objectives achieved by the program are unclear. While mainland China has clear emissions reduction targets nationwide, including those applied to Guangdong, the HKSAR has no definite legislation on such targets. Second, it is unclear why the Macau SAR has been exempted from the planning phase. If ultimately excused from the actual ETS, Macau could become a safe haven for regional producers of SO_2 emissions. Third, the Chinese Constitution and Hong Kong Basic Law are silent regarding the relationship between the SAR and other local governments in mainland China. If a party were to breach the agreement between these government entities, presently, no mechanisms exist to settle the dispute. Fourth, there is no centralized planning, coordination, or enforcement authority between the jurisdictions. International experience proves that

4. The Hong Kong and Macau Basic Laws define the SARs as local governments directly under the Central People's Government, thus making them similar in constitutional standing to provincial governments. Yet, the Basic Laws also guarantee that the SARs enjoy higher degrees of autonomy, including their own legal system and domestic legislative authority. That autonomy extends to all areas except three: (1) foreign affairs, (2) central-local affairs between the Central Government and the SAR, and (3) other matters falling exclusively within the jurisdiction of the Central Government. Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] arts. 2, 8, 18 (promulgated by the Standing Comm. Nat'l People's Cong., Mar. 31, 1993, effective Dec. 20, 1999) LAWINFOCHINA (last visited Apr. 10, 2010) (P.R.C.); Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] arts. 2, 8, 18 (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 4, 1990, effective July 1, 1997) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.).

5. Linden J. Ellis and Jennifer L. Turner, Environmental Cooperation Between Hong Kong and Guangdong, Apr. 29, 2008, http://www.wilsoncenter.org/ondemand/index.cfm?fuseaction=media.play&mediaid=A1FA8FC3-97DB-EA00-F18B1BFF78635CE9 (last visited Apr. 18, 2010).

these are the basic requirements of a successful ETS program.[6] While a Hong Kong-Guangdong Cooperation Joint Conference composed of representatives of both governments exists, it is merely consultative in nature and lacks authority.

A centralized delegation of regulatory powers is required for an effective ETS regime to function. Given China's unique constitutional structure, a supranational panel must be authorized to harmonize and oversee the cap fixing, market maintenance, compliance monitoring, and enforcement functions across all jurisdictions. This is true in the case of either a national or regional ETS that incorporates the SARs. Any non-binding substitute will result in a well-publicized and often criticized failure. Prior history indicates that executive agreements between the SARs and mainland China are feasible options for addressing bilateral issues, and their use to establish a permanent transboundary forum ensures flexibility and ongoing coordination among the three jurisdictions (Hong Kong, Macau, and the Guangdong Province) as implementation proceeds. This type of environmental panel would help integrate these three legal systems by serving as a portal through which ongoing implementation efforts can be directly undertaken. Even a transboundary panel with regional scope would be an exciting development. Though relatively small in geographic scope, the potential for cooperation between Hong Kong, Macau, and Guangdong Province in non-economic matters is enticing.[7] If all three could be made to co-exist and prosper within a successful public law framework, the resulting intercourse would provide a model for transboundary environmental cooperation to the world.

This article proposes that an effective Chinese ETS program that meaningfully includes the SARs must have supranational planning, monitoring, and enforcement capabilities and this article analyzes the legal and practical difficulties of designing an ETS program in both national and regional contexts. After this brief introduction, Part II establishes why ETS is necessary for China. Part III outlines the framework of environmental legislation in both mainland China and the SARs, with special emphasis upon the constitutional relationship between the two SARs and other local governments in mainland China. Part IV will discuss the history of emissions trading in China, focusing on the ETS experience

6. See *infra* Part IV for a discussion of the strengths and weaknesses of the U.S. Acid Rain Program, EU Emissions Trading Program, and Kyoto Protocol.

7. Hong Kong developed under British common law. Macau is still heavily influenced by the European civil law tradition. Jorge A. F. Godinho, Macau Business Law and Legal System 20 (Feb. 28, 2006) (unpublished manuscript, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=887153). Guangdong is part of a developing socialist state. XIAN FA [Constitution] pmbl. (1982) (P.R.C.).

in Jiangsu Province. Part V will go beyond this provincial case study to analyze the practical difficulties and shortcomings that have hampered other leading ETS regimes, namely the U.S. ARP and European Union Emissions Trading System, drawing out the fundamental mechanisms an ETS must possess in order to be effective. Part VI evaluates current prospects for regional and national ETS regimes based upon a review of existing regulatory frameworks and the components discussed in Part V. Finally, Part VII introduces trading program in China, suggesting the need for a powerful supranational compliance and enforcement mechanism to help manage long-term transboundary environmental policy.

I. GOOD FOR THE GOOSE AND THE GANDER: WHY ETS IS NECESSARY FOR CHINA

China would benefit greatly from ETS because it provides the best policy tool for balancing two of the Chinese state's paramount concerns: providing public goods (in this case, environmental health and safety) and preserving economic growth potential. History proves that ETS, even strictly administered, can do both. By 1990, the environment of the United States of America had suffered decades of toxic pollutant deposition.[8] As scientific studies began echoing the adverse health effects of human exposure to air pollutants,[9] exponentially increasing demands for power were resulting in the unceasing construction of new power plants. Exist-

8. U.S. Environmental Protection Agency, Acid Rain in New England: A Brief History, http://www.epa.gov/NE/eco/acidrain/history.html (last visited Apr. 18, 2010). "In 1980, the U.S. Congress passed an Acid Deposition Act. This Act established a 10-year research program under the direction of the National Acidic Precipitation Assessment Program (NAPAP). . . . In 1991, NAPAP provided its first assessment of acid rain in the United States. It reported that 5% of New England Lakes were acidic, with sulfates being the most common problem. They noted that 2% of the lakes could no longer support Brook Trout, and 6% of the lakes were unsuitable for the survival of many species of minnow. Subsequent Reports to Congress have documented chemical changes in soil and freshwater ecosystems, nitrogen saturation, decreases in amounts of nutrients in soil, episodic acidification, regional haze, and damage to historical monuments." *Id.*

9. Much of the knowledge about the deleterious effects of sulfur and nitrogen oxides on human physiology have been derived from epidemiological, human clinical, and animal toxicology studies. *See* Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society, *Health Effects of Outdoor Air Pollution*, 153 AM. J. RESPIRATORY & CRITICAL CARE MED. 3, 3-50 (1996). Possible short-term effects of air pollution exposure include nose, throat, and upper respiratory infections such as bronchitis and pneumonia, headaches, nausea, allergic reactions, and aggravation of asthma and emphysema. *Id.* Long-term health effects can include increased risk of lung cancer, chronic respiratory disease, heart disease, and damage to the brain, liver and kidneys. *Id.*; *see also* World Health Org. [WHO], *WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulphur Dioxide: Global Update 2005*, U.N. Doc. WHO/SDE/PHE/OEH/06.02 (2006). *See generally* Effects of Acid Rain – Human Health, *supra* note 3; Goyer et al, *supra* note 3; Hedley et al., *supra* note 3.

ing regulatory methodologies of the era were simply inadequate to handle the massive challenge. It became so evident that something drastic must be done to reverse these trends that President George W. Bush steered a controversial program through a skeptical U.S. Congress, by a large margin.[10] In fact, the idea of employing market mechanisms to combat air pollution was nothing new in 1990. J.H. Dales proposed it over twenty years before in his seminal work, *Pollution, Property & Prices: An Essay in Policy-Making and Economics*.[11] Dales proposed that economic incentives could be designed to provide financial benefits for pollution reduction, thereby making their imposition more acceptable than the traditional regulatory approaches of the era.[12] The idea was developed into a theory through a series of pilot programs and scholarly commentaries,[13] culminating in its application in the U.S. ARP and later the EU Emissions Trading System and Kyoto Protocol. ETS is the only policy tool devised that is powerful and dynamic enough to combat the massive SO_2 problem that confronted the United States and

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10. The House of Representatives voted to pass the new Clean Air Act by a vote of 401-25 on October 26, 1990; the next day, the Senate passed the amendments by a margin of 89-10. Press Release, U.S. Environmental Protection Agency, Clean Air Act Amendments of 1990 Legislative Chronology, http://www.epa.gov/history/topics/caa90/02.htm (last visited Apr. 18, 2010).

11. J.H. DALES, POLLUTION, PROPERTY & PRICES: AN ESSAY IN POLICY-MAKING AND ECONOMICS (1968). *See generally* David W. Montgomery, *Markets in Licenses and Efficient Pollution Control Programs*, 5 J. ECON. THEORY 395 (1972); T.H. TIETENBERG, EMISSIONS TRADING: AN EXERCISE IN REFORMING POLLUTION POLICY (1985). Both Montgomery and Tietenberg built upon Dales' efforts at utilizing market mechanisms to combat air pollution.

12. DALES, *supra* note 11, at 99-100.

13. The most developed precursor program began in 1974 as a means to reduce airborne lead by reducing the lead content of gasoline. U.S. ENVTL. PROT. AGENCY, EPA-230-R-92-001, THE UNITED STATES EXPERIENCE WITH ECONOMIC INCENTIVES TO CONTROL ENVIRONMENTAL POLLUTION § 5.2 (1992). After several years of regulatory phase outs, the EPA implemented a transferable permit program pursuant to the CAA to completely eliminate lead in gasoline in 1982. *See* Richard G. Newell & Kristian Rogers, *The U.S. Experience with the Phasedown of Lead in Gasoline* 1-5 (Res. for the Future, Discussion Paper, 2003), *available at* http://web.mit.edu/ckolstad/www/Newell.pdf. By the early 1980's, the phasedown had led to an 80% reduction in gasoline lead content. *Id.* at 4. The U.S. program that implemented the Montreal Protocol of 1987 and 1990 update also included such a program. *See* Clean Air Act §§ 601-607, 42 U.S.C. §§ 7671-7671(f); *see also* Montreal Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, S. TREATY DOC. NO. 100-10, 26 I.L.M. 1541; U. N. Env't Programme, *Report of the Second Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, U.N. Doc. UNEP/OzL. Pro. 2/3 (1990), *reprinted in* 30 I.L.M. 537. A major intrastate ETS that predates the ARP is the Regional Clean Air Incentives Market ("RECLAIM"), that seeks to abate nitrogen oxides (NO[x]) in the greater Los Angeles area. *See* John P. Dwyer, *The Use of Market Incentives in Controlling Air Pollution: California's Marketable Permits Program*, 20 ECOLOGY L.Q. 103, 104 (1993); Alexander K. Wang, Comment, *Southern California's Quest for Clean Air: Is EPA's Dilemma Nearing an End?*, 24 ENVTL. L. 1137, 1151-52 (1994). A flurry of complimentary scholarship preceded the Congressional debate on the ARP. *See, e.g.*, Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333 (1985); James T.B. Tripp & Daniel J. Dudek, *Institutional Guidelines for Designing Successful Transferable Rights Programs*, 6 YALE J. ON REG. 369, 391 (1989).

now confounds China. There is no other instrument able to meaningfully address the pollution crisis while preserving China's economic growth potential. Whether the Chinese state has a sufficient institutional foundation to build an ETS upon it is a lively debate considered in Part IV, but its desirability is beyond reproach.

ETS represents a policy approach, designed to utilize market forces to engender a faster and less expensive allocation of resources among a group of polluters. The underlying theory is simple. First, an overall cap, or maximum amount of emissions per compliance period, is set for all sources under the program, based on the projected cuts needed to achieve a specific environmental goal.[14] Authorizations to pollute are allocated among the affected sources in the form of emission allowances, the total value of which amount to less than the cap ceiling.[15] The sources may tailor and implement their own pollution control strategies in consideration of their own special circumstances.[16] The polluters then have three basic choices from which to design their compliance strategies:

> One option is to limit their emissions to exactly what their permits allow, subject to penalties for exceeding these levels. Second, polluters may emit less than their permits authorize (known as "over control") and attempt to sell their excess permits to other polluters. Third, they may buy additional permits, thereby allowing more emissions.[17]

All sources must report their emissions and surrender the appropriate number of allowances at the end of the compliance period.[18]

Several economic arguments have been advanced to support the claim that ETS is more efficient than the alternatives presented by traditional regulatory approaches. First, ETS allocates reduction measures to the sources that can reduce both costs and pollution most efficiently.[19] Transferable credits encourage sources

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14. Evan Goldenberg, Comment, *The Design of an Emissions Permit Market for RECLAIM: A Holistic Approach*, 11 UCLA J. ENVTL. L. & POL'Y 297, 300 (1993).

15. *Id.*

16. *See generally* DALES, *supra* note 11 (describing the considerations that a polluter will typically take into account).

17. Jeffrey M. Hirsch, Student Article, *Emissions Allowance Trading Under the Clean Air Act: A Model for Future Regulations?*, 7 N.Y.U. ENVTL. L.J. 352, 354 (1999).

18. U.S. Environmental Protection Agency, Acid Rain Program SO_2 Allowances Fact Sheet, http://www.epa.gov/airmarkets/trading/factsheet.html (last visited Apr. 18, 2010) [hereinafter Fact Sheet].

19. Isabel Rauch, *Developing a German and an International Emissions Trading System—Lessons from U.S. Experiences with the Acid Rain Program*, 11 FORDHAM ENVTL. LAW J. 307, 315 (1999-2000).

that can control their emissions quickest and cheapest to do so because they can sell any extra credits for additional profit.[20] Plants that act slower to meet emissions targets can purchase those excess credits.[21] ETS also creates a market for the research and development of newer and cleaner products, as developers reap financial rewards for implementing new technologies and selling excess credits.[22] In addition, ETS results in faster compliance and enhanced judicial economy, as the temptation to sue in courts is reduced when the installation of specific technologies under harsh timetables is no longer mandated.[23] All in all, significant regulatory costs are saved.[24]

A government agency using the traditional regulatory approach achieves "pollution reduction through various regulations, allocates control responsibility among the polluters, and establishes an enforcement mechanism to ensure that the reductions are met."[25] Compliance with program goals requires uniform technological installations and/or emission reductions.[26] Thus, ETS proponents argue that traditional regulatory approaches are unresponsive to the specific characteristics of numerous facilities, and are therefore, unnecessarily expensive.[27] Firms may have to spend more money than normal for other technologies more suitable to their particular needs.[28] Daniel Dudek, an architect of the U.S.

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20. *Id.*

21. *Id.*; *see also Tradeable Emmissions: Hearing Before the J. Economic Comm.*, 105th Cong. 105 (1997) (written statement of Daniel J. Dudek. Senior Economist, Environmental Defense Fund).

22. U.S. ENVTL. PROT. AGENCY, *supra* note 13, § 2.3.

23. Rauch, *supra* note 19, at 322.

24. Daniel Dudek projected massive savings from utility compliance costs could be between $1.7 billion and $3.4 billion a year by 2010; that $14.3 billion in savings could result from greater efficiency spurred by increased incentives to reduce energy use; and that the use of market-based controls might save as much as 75% over the costs associated with the same controls under traditional regulation. *Clean Air Act Amendments of 1989: Hearings on Acid Rain Before the Subcomm. On Environmental Protection of the Senate Comm. On Enivronment and Public Works*, 101st Congress, 195, 273 (1989) (statements of John Heinz, U.S. Senator, Pennsylvania and Daniel J. Dudek, Senior Economist, Environmental Defense Fund); Hirsch, *supra* note 17, at 364-65. In reality, the savings proved to be much higher. A 2005 study calculated that the ARP will save over $122 billion in annual benefits in 2010, while costing only $3 billion annually to implement. U.S. ENVTL. PROT. AGENCY, ACID RAIN AND RELATED PROGRAMS: 2007 PROGRESS REPORT 2 (2007) [hereinafter 2007 ARP REPORT].

25. Christopher S. Hooper, Student Article, *Limiting the Use of Emissions Allowances: A Statutory Analysis of Title IV of the 1990 Amendments to the Clean Air Act*, 5 N.Y.U. ENVTL. L.J. 566, 569 (1996).

26. *See* Dallas Burtraw & Byron Swift, *A New Standard of Performance: An Analysis of the Clean Air Act's Acid Rain Program*, 26 ENVTL. L. REP. 10411, 10411 (1996).

27. Matthew Polesetsky, Comment, *Will a Market in Air Pollution Clean the Nation's Dirtiest Air? A Study of the South Coast Air Quality Management District's Regional Clean Air Incentives Market*, 22 ECOLOGY L.Q. 359, 366-67 (1995).

28. Rauch, *supra* note 19, at 317.

ARP, summarizes the disadvantages of traditional regulatory policies:

> Archetypal CAC [(command and control)][29] regulations rely on uniform, inflexible, technology-based standards issued by the central government. This approach results in high compliance costs, restricts innovation, and discourages efficient use of resources. These rules also require detailed central planning of economic activity. Because the cost of controlling pollution varies among those subject to regulation, a CAC policy requiring them all to meet the same target, or to install the same technology, means that some regulated entities could achieve the same environmental protection through less costly means, or more protection for the same cost. Consequently, a CAC approach forces society to pay more for relatively expensive environmental protection.[30]

Before the 1990 Amendment to the U.S. Clean Air Act, American policymakers relied primarily on similar schemes.[31] The Chinese still do today.

Though opponents expressed concerns that ETS will result in extra administrative expenses, attributable to the costs of increased monitoring of compliance and maintenance of a competi-

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29. Dudek used the term "command and control" to refer to the blunt old methods of pollution control. Ruth Greenspan Bell argued later that this is a misnomer that appeals to free market proponents by invoking memories of the centrally planned economy of the Soviet Union, and that "traditional" should be used instead in the American context. *See* Ruth Greenspan Bell, Organisation for Economic Co-operation and Development [OECD], *Choosing Environmental Policy Instruments in the Real World*, at 9, CCNM/GF/SD/ENV(2003)10/FINAL, (Mar. 17-18, 2003), *available at* http://www.oecd.org/dataoecd/11/9/2957706.pdf.

30. Daniel J. Dudek et al., *Environmental Policy for Eastern Europe: Technology-Based Versus Market-Based Approaches*, 17 COLUM. J. ENVTL. L. 1, 3 (1992).

31. Since 1970, the SO_2 emissions of electric utilities have been regulated in order to achieve federally mandated local air quality standards (the National Ambient Air Quality Standards). For plants in existence in 1970, these standards codified in State Implementation Plans, typically have taken the form of maximum emission rates (pounds of SO_2 per million Btus of heat input). Plants built after 1970 are subject to New Source Performance Standards (NSPS), set at the federal level. Since 1978, NSPS for coal-fired power plants have effectively required the installation of capital-intensive flue gas desulfurization equipment (scrubbers) to reduce SO_2 emissions, which was an attempt to protect the jobs of coal miners in states with high-sulfur coal.

Dallas Burtraw, *Innovation Under the Tradable Sulfur Dioxide Emission Permits Program in the US Electricity Sector*, *in* INNOVATION AND THE ENVIRONMENT, 63, 65 (2000).

tive market,[32] a decade and a half after implementation, the U.S. ARP proved an effective and efficient means of meeting ambitious environmental goals. In total, the U.S. ARP successfully reduced annual SO_2 emissions by 43% from 1990 levels (a difference of 6.8 million tons), while electricity generation increased by 40% over the same time period.[33] Regulated sources emitted less than 8.95 million tons in 2007, meeting the final 2010 goal three years in advance.[34] Accordingly, significant decreases in acid deposition have been observed. Ambient SO_2 concentrations have fallen by an average of 40% nationwide,[35] while wet sulfate deposition decreased 35% in the Northeast and 33% in the Midwest.[36] Furthermore, a 2005 study calculated that the U.S. ARP will save over $122 billion in annual benefits in 2010, while costing only $3 billion to implement.[37] Thus, benefits exceed costs by a ratio of over 40:1. This experience has definitively proven that ETS is a highly effective vehicle for achieving broad improvements in environmental quality. In the years to come, the U.S. is expected to tighten caps even further, creating ETS frameworks for other toxins such as carbon dioxide and mercury, and incorporate Canada into a transboundary regime.[38]

Meanwhile, China has an immense air pollution problem. Three decades of unprecedented economic growth and correspondingly great energy demand have led to massive increases in airborne pollutant concentrations since 1978.[39] The Tenth Five Year

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32. Hirsch provides an excellent recap of concerns expressed during the debate over the 1990 amendments. For example, he cited statements of opposition by leaders of several power companies and West Virginia Senator Robert Byrd. *See* Hirsch, *supra* note 17 at 365-66; *see also* Jeanne M. Dennis, Comment, *Smoke for Sale: Paradoxes and Problems of the Emissions Trading Program of the Clean Air Act Amendments of 1990*, 40 UCLA L. REV. 1101, 1137 (1993).

33. 2007 ARP REPORT, *supra* note 24, at 2, 5-6.

34. *Id.* at 2.

35. *Id.* at 4.

36. *Id.* at 2.

37. Figures in year 2000 U.S. dollars. *Id.* at 2; Lauraine G. Chestnut & David M. Mills, *A Fresh Look at the Benefits and Costs of the U.S. Acid Rain Program*. 77 J. ENVTL. MGMT. 252, 255-56 (2005).

38. In July 2009 the U.S. House of Representatives passed a bill calling for carbon cap-and-trade. American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009). For a brief discussion of the current U.S.-Canada transboundary initiative, see Lin Feng & Jason Buhi, *The International Joint Commission's Role in the United States-Canada Transboundary Air Pollution Control Regime: A Century of Experience to Guide the Future*, 11 VT. J. ENVT. L. (forthcoming Fall 2009).

39. Historically, estimates of pollution concentration are expressed in terms of total suspended particulates (TSP). The average TSP concentration in these northern cities, where coal is burned for heating, is 337 $\mu g/m^3$. Although there has been improvement in many areas since the 1990s, the concentrations of particulate matter far exceed China's own standards. The average TSP concentration of major cities in China in 1990 was 379 $\mu g/m^3$ and by 2003 was still 256 $\mu g/m^3$, exceeding the Chinese national

Plan (2000-2005) sought a nationwide SO_2 emission reduction of 10%, but relied exclusively on command and control mechanisms to attain that goal.[40] These included: "(i) mandating installation of flue gas desulfurization units in power plants;[41] (ii) closing small, inefficient boilers;[42] (iii) strengthening regulations regarding coal washing; (iv) requiring increased use of low-sulfur coal; and (v) introducing total emissions control policies."[43] Unfortunately these means alone proved insufficient. "[E]missions increased by 27%, primarily because of a 64% expansion in coal-fired power plant capacity."[44] In 2005, China's total SO_2 emissions were 25.9 million tons, the highest in the world.[45] Hong Kong's efforts at SO_2 abatement using traditional methods have also been neutralized by the rapid increase of upwind emissions in Guangdong Province.[46] Thus, to encourage sustainable reductions, Beijing, Guangzhou, and Hong Kong have all acknowledged that ETS mechanisms need to be utilized to complement existing traditional mechanisms.[47]

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standard of 200 µg/m3. By comparison, on the eve of the landmark Clean Air Act signed by President Richard Nixon in 1970, the average TSP concentration in the United States was 70 µg/m³. Even at the ninetieth percentile—the top tenth of most polluted areas—the U.S. concentration level in 1970 was only 106 µg/m³.

Mun S. Ho & Dale W. Jorgenson, *Greening China: Market-Based Policies for Air-Pollution Control*, HARV. MAG., Sept.-Oct. 2008, at 32, 32.

40 ASIAN DEVELOPMENT BANK, DESIGN OF THE NATIONAL SULFUR DIOXIDE EMISSION TRADING SYSTEM: CHINA, PEOPLE'S REP. OF (2008), http://pid.adb.org/pid/TaView.htm?projNo=42056&seqNo=01&typeCd=2 (last visited Apr. 18, 2010) [hereinafter ADB].

41. "As of 2000, only 2% (5 GW) of thermal generation capacity had flue gas desulfurization units installed. By the end of 2007, this percentage had increased to 48.7% (270 GW), and it is projected to increase to 60% by 2010." *Id.*

42. Power generation in the PRC has historically been dominated by small, inefficient generating units, which tend to lack sophisticated emission-control equipment. In 2005, 29.4% of installed capacity was from units less than 100 MW, however, this share is expected to decrease due to (i) mandated policies on closing small boilers (25 GW were decommissioned in 2006 and 2007), and (ii) dominance of larger units for new installations.

Id.

43. *Id.*

44. *Id.*

45. *Id.*

46. *See* CH2M HILL (CHINA) LTD., STUDY OF AIR QUALITY IN THE PEARL RIVER DELTA REGION ¶ 1.1.3 (2002), *available at* http://www.epd.gov.hk/epd/english/environmentinhk/air/studyrpts/files/final_rept.pdf ("Another air pollution problem that HKSAR is facing is regional air quality pollution. . . . Contrary to the first acute street level pollution, which stems mainly from local vehicle emissions, the deteriorating air pollution is caused by both the local air pollution sources and the regional air quality problem in the Pearl River Delta Region . . . ."); D. Y. C. Leung et al., *An Overview of Emissions Trading and its Prospects in Hong Kong*, 12 ENVTL. SCI. & POL'Y 92, 92 (2009); HKSAR Environmental Protection Department, Air Pollution Control Strategies, http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/strategies_apc.html (last visited Apr. 18, 2010) ("Notwithstanding the very substantial reduction in local [Hong Kong] emissions, the visibility has been deteriorating due to worsening of the regional background air quality . . . .").

47. The negotiations for a regional Pearl River Delta ETS between Hong Kong and

Working in concert, traditional and ETS elements have proven capable of achieving ambitious environmental goals. The question remains as to whether a sufficient legal and regulatory foundation exists on which to build such programs. If the answer is yes, how to meaningfully include the Chinese SARs in a transboundary regime must also be determined.

II. THE CONSTITUTIONAL SETTING FOR ENVIRONMENTAL LAW-MAKING IN THE PEOPLE'S REPUBLIC OF CHINA AND ITS SPECIAL ADMINISTRATIVE REGIONS

To help answer these questions, a review of China's constitutional matrix and environmental lawmaking in each of the applicable jurisdictions is necessary. The division of environmental lawmaking powers and a description of the associated legislative procedures will be discussed first in the context of mainland China, then the Special Administrative Regions (SARs).

A. Environmental Law-Making Authority in China

China's constitutional structure is underpinned by the People's Congress system. Accordingly, the National People's Congress (NPC) is the highest organ of national power and authority.[48] Since the NPC meets in full session for only about two weeks annually, in the interim, it establishes a Standing Committee (NPCSC) to perform its ongoing duties.[49] The NPC and NPCSC, as the national legislature, have authority to enact all national laws.[50] The 1982 Constitution and the Legislation Law divide authority between the two institutions and set out the scope of matters on which each enjoys exclusive jurisdiction.[51] The NPC is responsible for enacting

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Guangdong demonstrate the need for stronger measures, while Beijing has indicated that a more ambitious ETS may be part of the nation's next five-year plan. *See China Sees Emission Trading Pilot in Next Econ Plan*, REUTERS, Sept. 27, 2009, http://www.reuters.com/article/idUSTRE58Q0EA20090927 (last visited Apr. 18, 2010).

48. XIAN FA [Constitution] art. 57 (1982) (P.R.C.).

49. *Id.* art. 61; *see also* DANIEL C.K. CHOW, THE LEGAL SYSTEM OF THE PEOPLE'S REPUBLIC OF CHINA IN A NUTSHELL 87-96 (2003). "[I]n practice the Standing Committee is far more powerful than the NPC as a whole. . . . Much smaller, more professional, and meeting every two months usually for one week, the Standing Committee actually fulfills most of the functions of the NPC." *Id.* at 91-92.

50. XIAN FA [Constitution] art. 58. All other national constitutional organs, including the State Council, the President, the Central Military Commission, the Supreme People's Court, and the Supreme People's Procuratorate are established under and accountable to the NPC. *See id.* arts. 3, 58.

51. According to the XIAN FA [Constitution] arts. 62 and 67, the NPC will enact all fundamental laws of the nation, while the NPCSC will enact all other laws. Article 8 of the Legislation Law of the P.R.C. provides that only national laws can be enacted on the following categories of matters: (1) state sovereignty, (2) the establishment, organization and au-

and amending all fundamental laws in China, including the Constitution; all national laws concerning organization of various constitutional organs; and all national laws concerning various essential aspects of the legal system.[52] The NPCSC is responsible for enacting all other national laws, including environmental laws such as the Environmental Protection Law,[53] the Water Pollution Prevention and Control Law,[54] and the Air Pollution Prevention and Control Law (APPCL).[55] A common feature of many of these national laws is that they contain many general principles but few details; specifics are often provided by other sources of law.

Those laws may come from the second body which enjoys national legislative authority, the State Council.[56] The 1982 Constitution grants the State Council the ability to "adopt administrative measures, enact administrative rules and regulations, and issue decisions and orders in accordance with the Constitution and the statutes. . . ."[57] These are classified generally as administrative regulations. The State Council may adopt regulations for two types of matters: first, "matters that demand the enactment of an administrative regulation for the purpose of implementing a law,"[58] and

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thority of the People's Congresses, People's Governments, People's Courts and People's Procuratorates at all levels, (3) the autonomy of ethnic regions, governance of special administrative regions, and autonomy at the grass roots level, (4) crimes and criminal punishment, (5) deprivation of political rights of citizens, or compulsory measures and penalties that restrict personal freedom, (6) expropriation of non-state-owned assets, (7) basic civil systems, (8) fundamental aspects of the economic system and fundamentals concerning fiscal, taxation, customs, finance and foreign trade, (9) litigation and arbitration systems, and (10) other matters for which laws must be enacted by the National People's Congress or its Standing Committee. Li fa fa [Law on Legislation] art. 8 (promulgated by the Standing Comm. Nat'l People's Cong., Mar. 15, 2000, effective July. 1, 2000) 2000 STANDING COMM. NAT'L PEOPLE'S CONG GAZ. 112 (P.R.C.).

52. *See* XIAN FA [Constitution] art. 62; CHOW, *supra* note 49, at 257, 280, 311. For example, the NPC's work includes China's Criminal Law, Criminal Procedural Law, General Principles of Civil Law, Civil Procedural Law, and Contract Law. CHOW, *supra* note 49, at 257, 281, 311-12, 324-27, 337-41.

53. Zhonghua Renmin Gongheguo Huanjing Baohu Fa [Environmental Protection Law] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 1989, effective Dec. 26, 1989) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.).

54. Zhonghua Renmin Gongheguo Shui Wuran Fangzhi Fa [Water Pollution Prevention and Control Law] (promulgated by the Standing Comm. Nat'l People's Cong., May 11, 1984, effective May. 11, 1984) (amended 1996, 2008) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.).

55. Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law] (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 29, 2000, effective Sept. 1, 2000) (amended 1987, 1995, 2000) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.).

56. XIAN FA [Constitution] art. 85. The State Council is defined in the Constitution as "the Central People's Government of the People's Republic of China," "the executive body of the supreme organ of state power," and "the highest organ of State administration." *Id.*

57. *Id.* art. 89(1).

58. Li Fa Fa [Law on Legislation] art. 56.

second, matters listed in Article 89 of the Constitution.[59] This authority has been exercised by the State Council to enact the Detailed Rules for the Implementation of the APPCL. The legal effect of these administrative regulations is lower than national laws but higher than the other sources of law yet to be introduced.

The Ministry of Environmental Protection (MEP) exists on the third-tier of legislatively authority, which includes all ministries and commissions directly under the State Council.[60] Such organs can issue departmental regulations, another formal source of law recognized under the 1982 Constitution and Legislation Law.[61] While departmental regulations can only be enacted to implement relevant laws or administrative regulations already in existence,[62] very often such regulations provide the most important and detailed provisions on environmental protection.

Finally, at the local level, two groups of institutions possess legislative authority: the local people's congress and the local people's government.[63] For example, the Guangdong Provincial People's Congress and its standing committee are the local legislature in Guangdong Province. They have authority to adopt legislation of local import that does not contradict higher sources of law.[64] Thus, Guangdong can adopt local environmental protection legislation to supplement national rules, on the condition that such new regulations do not contravene the higher laws.[65] In the area of air pollution prevention and control, the Methods for the Prevention and Control of Air Pollution in the Pearl River Delta Region of Guangdong Province were recently issued.[66] However, it is not certain whether such provincial or local legislation enjoys higher legal status than those departmental regulations issued by Ministry of Environmental Protection or vice versa.[67] If a conflict arises be-

59. XIAN FA [Constitution] art. 89 (sets out the functions and powers of the State Council which altogether encompass 18 items).

60. *See* XIAN FA [Constitution] arts. 86, 89. The MEP was formerly known as the State Environmental Protection Administration (SEPA) which was restructured and renamed the Ministry of Environmental Protection in 2008. For a concise history of the MEP, see Yang Xi, *SEPA Gets Stronger*, CHINA.ORG.CN, Mar. 10, 2008, http://www.china.org.cn/environment/news/2008-03/10/content_12143406.htm (last visited Apr. 18, 2010).

61. XIAN FA [Constitution] art. 90; Li fa fa [Law on Legislation] art. 71.

62. *See* Li Fa Fa [Law on Legislation] art. 71.

63. XIAN FA [Constitution] art. 95.

64. XIAN FA [Constitution] art. 100. The higher sources of law include the Constitution, all national laws enacted by the NPC and NPCSC, and administrative regulations. *See* XIAN FA [Constitution] art. 100.

65. *Id.*

66. People's Government of Guangdong Province, Methods for the Prevention and Control of Air Pollution in the Pearl River Delta Region, http://www.gd.gov.cn/govpub/zfwj/zfxxgk/gz/200903/t20090330_88639.htm (last visited Apr. 18, 2010) (translated by author). They were adopted on February 27, 2009 and came into effect on May 1, 2009. *Id.*

67. In addition, at the municipal level some municipal people's congresses, their

tween the two sources, a final decision will be made by the NPCSC as to which should prevail.[68] The implication is that the NPCSC must make this decision on a case-by-case basis.

The distribution of legislative authority in China is unique in three aspects. First, the national legislature consists of two bodies, the NPC and NPCSC, with separate jurisdictions. Second, legislative authority has been granted to both legislative and executive organs by the Constitution. Third, two levels of local governments (provincial and municipal) enjoy legislative authority under the 1982 Constitution. The complexities do not end there, however, as China's constitutional structure also incorporates unique entities known as Special Administrative Regions within its complex aegis.

B. Environmental Law-Making in the Hong Kong and Macau SARs

The constitutional source of SAR legislative authority is Article 31 of the 1982 Constitution, providing that "[t]he State may establish special administrative regions when necessary. The systems to be instituted in special administrative regions shall be prescribed by law enacted by the National People's Congress in the light of the specific conditions."[69] Under that authorization, the NPC has enacted the Basic Law of the HKSAR as well as the Basic Law of Macau, each the highest law in its respective region. The preambles of the Basic Laws make it clear that they are established under the principle of "one country, two systems."[70] Though China resumed sovereignty over Macau two years later than it did over Hong Kong, it did so under the same principle.[71] Thus, immediately forthcoming discussion concerning law-making authority in the

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standing committees, and municipal people's governments (executive branches) also enjoy legislative authority under the 1982 Constitution which will not be discussed in detail in this paper.

68. *See* Li Fa Fa [Law on Legislation] art. 86(2).

69. XIAN FA [Constitution] art. 31.

70. Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] pmbl. (promulgated by the Standing Comm. Nat'l People's Cong., Mar. 31, 1993, effective Dec. 20, 1999) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.). This ensures that the socialist system and policies as practiced in mainland China will not be applicable to the Hong Kong and Macau SARs. The basic policies concerning the governance of the HKSAR will be those elaborated on in the 1984 Sino-British Joint Declaration and later incorporated into the Basic Law at Article 5. The Joint Declaration is a bilateral treaty between China and the United Kingdom. Joint Declaration of the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China on the Question of Hong Kong, U.K.-P.R.C., Dec. 19, 1984, 23 I.L.M. 1366 (1984), *available at* http://www.cmab.gov.hk/en/issues/jd2.htm.

71. *See* Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] art. 5.

HKSAR also generally describes the procedure used in the Macau SAR.

The Basic Laws define the SARs as local governments directly under the Central People's Government,[72] thus making them similar in constitutional standing to provincial governments. Yet, the Basic Laws also guarantee that the SARs enjoy higher degrees of autonomy, including their own legal system and domestic legislative authority.[73] That autonomy extends to all areas except three: (1) foreign affairs, (2) central-local affairs between the Central Government and the SAR, and (3) other matters falling exclusively within the jurisdiction of the Central Government.[74] The local Legislative Council, (LegCo) can enact ordinances in any other areas of law, including environmental protection.[75] For example, the HKSAR LegCo has enacted an Air Pollution Control Ordinance (APCO).[76] To further this proclamation, the HKSAR LegCo may delegate authority to the SAR's executive branch (in the case of the APCO, the Environmental Protection Department) to adopt subsidiary legislation.[77]

Comparatively speaking, the legislative authority enjoyed by the SARs is formidable as compared to local governments in mainland China.[78] Provincial people's governments are only allowed to adopt laws for two categories of matters under the Legislation Law: (1) where a local regulation is required in light of actual circumstances of the jurisdiction for the purpose of implementing a law or administrative regulation or (2) for matters of local concern for which enactment of a local regulation is required.[79] The latter must be enacted according to specific circumstances and actual needs, with the added condition that it does not contravene any provision of the Constitution, national laws, or administrative reg-

72. *Id.* art. 12; Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] art. 12 (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 4, 1990, effective July 1, 1997) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.).

73. Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] arts. 2, 8, 18; Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] arts. 2, 8, 18.

74. Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] art. 18; Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] art. 18.

75. Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] art. 71; Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] art. 73.

76. Air Pollution Control Ordinance, (1997) Cap. 311 (H.K.).

77. For example, Air Pollution Control Ordinance §7(1) provides that "[t]he Secretary shall, after consultation with the Advisory Council on the Environment, establish for each air control zone air quality objectives or different objectives for different parts of a zone."

78. Professor Yash Ghai has observed that "HKSAR has more powers than any autonomous region or federal unit, but their exercise will be subject to closer scrutiny and supervision than powers elsewhere." YASH GHAI, HONG KONG'S NEW CONSTITUTIONAL ORDER: THE RESUMPTION OF CHINESE SOVEREIGNTY AND THE BASIC LAW 185 (2nd ed. 1999).

79. Li Fa Fa [Law on Legislation] art. 64.

ulations.[80] In contrast, the only consistent requirement for SAR legislation is that the legislation not contravene the Basic Law.[81] Thus, SAR legislation can be in open contravention of other national laws and even other provisions of the national Constitution. The authority of a SAR LegCo is subject to few conditions. All legislation adopted by the LegCo must be submitted to the NPCSC,[82] and the NPCSC has limited authority to veto any legislation on the ground that it is inconsistent with the Basic Law.[83] However, the NPCSC does not have the authority to make any amendments, nor may it apply any other national laws outside the scope of the Basic Law.[84] Thus, the NPC has, through the Basic Law, voluntarily restricted its legislative authority with regard to the SARs.[85]

Though the Basic Law includes provisions on the central-local relationship between the SARs and mainland China, it does not clearly state how transboundary issues, such as air pollution should be addressed, or what the relationship between the SARs and other governments in mainland China should be.

C. The Constitutional Relationship Between the Two SARs and Other Local Governments in Mainland China

The relationship between the two SARs and Central Governmental organs, including the various ministries and commissions, is not clearly spelled out in local constitutional law. Furthermore, the Basic Laws are silent regarding the relationship between the SARs and the other local and provincial governments. From a constitutional perspective, these entities exist at the same level, directly under the State Council.[86] No legal obstacles exist for the two local governments in China to enter into an agreement on any matters of common concern. What is not clear is the legal status of

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80. *Id.* art. 63.

81. *See* Xiangang ji ben fa [Basic Law of the Hong Kong Special Administrative Region] arts. 17, 18.

82. *Id.* art. 17.

83. Veto authority is limited to legislation concerning matters exclusively within the scope of the Central Government or matters of central-local relationship between the Central Government and the HKSAR. *See generally id.*

84. *Id.* arts. 17, 18.

85. *See id.* arts. 16-18. In addition, the Basic Law has also made it clear that the Central People's Government will be responsible for all foreign affairs matters. *Id.* art. 13. In those areas, the Central People's Government may enter into international treaties and may extend their application to the HKSAR after consulting with the HKSAR Government on the needs of the HKSAR. *Id.* art 153. Except for external matters, the Basic Law has granted authority to the HKSAR to enter agreements with foreign countries in the name of Hong Kong, China under article 151.

86. *See id.* art. 12; Aomen ji ben fa [Basic Law of the Macao Special Administrative Region] art. 12; *see also* XIAN FA [Constitution] art. 62(12)-(13).

such an agreement under the Constitution and how to enforce such an agreement if one party breaches it. No mechanisms exist at present if a dispute were to arise between one of the SARs and a local government in mainland China. This must be considered if the HKSAR is going to enter into an emissions trading scheme with its neighbor to the north, Guangdong Province.

Two bilateral precedents exist that are worthy of consideration as proof that establishing a transboundary tribunal is possible. The first is judicial. In accordance with Article 95 of the Basic Law of the HKSAR, "[t]he Hong Kong Special Administrative Region may, through consultations and in accordance with law, maintain juridical relations with the judicial organs of other parts of the country, and they may render assistance to each other." The Supreme People's Court in mainland China and the HKSAR judiciary have reached agreements with each other.[87] The second precedent is economic, as the Central Government and the HKSAR have signed the Closer Economic Partnership Arrangement (CEPA) and six supplements.[88] Though different views exist with regard to the legal status of the CEPA in international law (especially vis-à-vis WTO obligations) no challenges have been raised so far. Hence, history indicates that bilateral executive agreements between the SARs and mainland China are feasible options for addressing issues of common concern that are not jointly shared under the Constitution. This becomes an intriguing vehicle for establishing a transboundary forum in the context of pollution, especially as the need for uniform compliance and enforcement becomes clearer. However, neither of the two precedents provides a desirable dispute resolution mechanism that could be adopted.[89] The uncertainty of such an agreement under the Constitution and the likelihood of disputes that may arise between parties on two sides of the border provides compelling justifications for the incorporation of a

87. On July 14, 2006, the HKSAR and mainland China signed the Arrangement on Reciprocal Recognition and Enforcement of Judgments in Civil and Commercial Matters by the Courts in the Mainland and of the HKSAR. The text of the Arrangement can be found at http://www.legislation.gov.hk/intracountry/eng/pdf/mainlandrej20060719e.pdf (last visited Apr. 18, 2010). On April 23, 2008, the LegCo passed the Mainland Judgments (Reciprocal Enforcement) Bill, which was promulgated by the Chief Executive on April 30, 2008. *See* Mainland Judgments (Reciprocal Enforcement) Ordinance, (2008) Cap. 597 (H.K.). Information on the Bill is also available at http://www.legco.gov.hk/yr06-07/english/bc/bc56/general/bc56.htm (last visited Apr. 18, 2010).

88. Mainland and Hong Kong Closer Economic Partnership Agreement (CEPA), H.K.-P.R.C., June 29, 2003, *available at* http://www.tid.gov.hk/tc_chi/cepa/legaltext/cepa_legaltext.html (translated by author).

89. Article 19(5) of CEPA provides that "[t]he two sides shall resolve any problems arising from the interpretation or implementation of the 'CEPA' through consultation in the spirit of friendship and cooperation." *Id.*

strong dispute resolution mechanism in any agreements between the SARs and the Mainland on cross-border air pollution.

III. THE HISTORICAL DEVELOPMENT OF EMISSIONS TRADING IN CHINA

Though China has yet to develop a national regime, the country has conducted emissions trading for nearly a decade in provinces and municipalities in the mainland. As it is common in China for new bureaucratic innovations to be tested at local and regional levels to gauge effectiveness before national adoption,[90] the local experiments have been successful enough to warrant broader application. The regional efforts of HKSAR and Guangdong are laudatory as possible constitutional solutions and for the pressure they put on Beijing to adopt a national ETS. While the regional governments should be encouraged to continue their efforts, the time has already arrived to implement a national ETS program. This section will trace the history of ETS as applied in China, focusing upon the reportedly successful program in Jiangsu Province.

Government regulation of various pollutants in mainland China did not start until the NPCSC enacted the Environmental Protection Law, on a trial basis, in 1979.[91] Several additional pollution prevention and control laws were enacted in the 1980's.[92] At that time their focus was ensuring that polluters met various pollutant discharge standards.[93] As China's rapid economic development exacerbated overall emissions, it became apparent that discharge standards alone were insufficient remedies. Limits on the total quantity of emitted pollutants had to be set to sustain ecosystem viability. Thus, following successful examples in the United States, various local ETS levels were implemented in the late 1980's.[94]

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90. Bell, *supra* note 29, at 13.

91. The Environmental Protection Law was made formal in 1989. Zhonghua Renmin Gongheguo Huanjing Baohu Fa [Environmental Protection Law].

92. *See, e.g.*, Haiyang Renmin Gongheguo de Zhongguo Huanjing Baohu Fa [Marine Environment Protection Law] (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 23, 1982, effective Mar. 1, 1983) LAWINFOCHINA (last visited Apr. 18, 2010) (P.R.C.); Zhonghua Renmin Gongheguo Shui Wuran Fangzhi Fa [Water Pollution Prevention and Control Law]; Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law].

93. *See, e.g.*, Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law], arts. 7, 11, 12, 18, 22, 25, 30.

94. The Chinese national authorities remained largely hesitant to accept foreign policy drafting advice for another decade, but this trend began to reverse in the 1990's, as evidenced during the early efforts of the NPC Environmental Protection and Natural Resource Conservation Committee to exchange views with foreign experts on significant legislative proposals. Richard J. Ferris & Hongjun Zhang, *Reaching Out to the Rule of Law: China's*

Their development can be divided into two main periods: a starting period and an experimental period.[95]

A. Starting Period (1987-2000)

As Professor Wang observes, Chinese ETS policy and practice developed gradually upon the adoption of basic national standards for environmental protection.[96] China's first ETS was implemented in 1987 when pollution-emitting sources in Shanghai began trading quotas allocated to them by the local environmental protection bureau for various water pollutants.[97] That experiment begot a national law in 1988, when the State Environmental Protection Agency (SEPA, the forerunner of the Ministry of Environmental Protection) promulgated the Interim Methods on Administration of Licenses for Discharge of Water Pollutants. The Interim Measures stipulated the total quantity of water pollutants permitted for each local government and allowed sources to trade their discharge permits.[98] In 1991, SEPA introduced a licensing system for the discharge of air pollutants in sixteen cities.[99] Beginning in 1994, ETS was employed in six of those cities in order to gain practical experience.[100] In 1996, the State Council approved a proposal by SEPA to set total emission caps and licenses for all major pollutants throughout mainland China during the Ninth Five-Year Plan Period (1996 to 2000).[101] When the APPCL was amended for the second time in 2000, setting caps on the emission of pollutants,[102]

Continuing Efforts to Develop and Effective Environmental Law Regime, 11 WM. & MARY BILL RTS. J. 569, 601 (2003). The practice is now well accepted to the point where consideration of international models is seen to bolster legislative proposals. *Id.* at 601-02.

95. Professor Wang Jinnan actually divided the development into three periods: a starting period from 1988-2000, an experimental period from 2001-2006, and a deepening period of the experiment from 2007 onwards. *See* Wang et al., *Paiwu Jiaoyi Zhidu de Zuixin Shijian yu Zhanwang* [The Latest Practice of Emission Trading System and Its Future], 10 ENVTL. ECON. 31, 31-45 (2008) (translated by author).

96. *Id.*

97. *Id.* at 36.

98. Dui Shui Wuran Wu Paifang Xuke Zheng Guanli Zhanxing Banfa [Interim Measures on the Management of Water Pollutants Discharge Permit] arts. 11, 21 (promulgated by the Nat'l Envtl. Prot. Agency., Mar. 20, 1988, effective Mar. 20, 1988) FAOLEX (last visited Apr. 18, 2010) (P.R.C.).

99. Li Zhiping, *The Challenges of China's Discharge Permit System and Effective Solutions*, 24 TEMP. J. SCI. TECH. & ENVTL. L. 375, 377 (2005).

100. The six cities are Baotou, Kaiyuan, Liuzhou, Taiyuan, Pingdingshan, and Guiyan. *See* Wang et al., *supra* note 95, at 36.

101. *See* Wang Jinnan et. al., *Paiwu Jiaoyi Zhidu de Zuixin Shijian yu Zhanwang* [The Latest Practice of Emission Trading System and Its Future] at 10 (2008), *available at* www.csfee.org.cn/uploadfile/wangjn/排污交易制度的最新实践和展望.pdf (translated by author).

102. Barbara A. Finamore & Tauna M. Szymanski, *Taming the Dragon Heads: Controlling Air Emissions From Power Plants in China—An Analysis of China's Air Pollution Poli-*

the first requirement for implementing a national ETS was embraced.

B. Experimental Period (2001- Present)

The period from 2001 to 2005 marked the Tenth Five-Year Plan Period in mainland China, during which the environmental focus was on controlling the total quantity of pollutants through the implementation of licensing systems.[103] With the support of foreign expertise and funding from the United States Environmental Protection Agency (EPA), Resources for the Future, the Chinese Academy for Environmental Planning, and the Asian Development Bank, the first local ETS scheme was adopted in Shanxi Province for Taiyuan City in 2001.[104] At that time, SEPA formally experimented with SO_2 emissions trading in seven provinces and municipalities through one state-owned electricity-generating group.[105] During the same time period, ETS was also tried for water pollutants, but with less publicity.[106]

Since 2007, ETS has rapidly expanded throughout mainland China as more local legislation has been enacted and various trading markets established.[107] Experiments were contemporaneously carried out in Jiangsu, Henan, and Shandong Provinces as well as Shanghai Municipality. Corresponding trading markets were established at Jiaxin City in Zhejiang Province,[108] Wuhan City in Hubei Province, Beijing, and Shanghai. Moreover, an experiment became regional in the case of the Yangtzi River Delta Region, an area including Jiangsu Province, Zhejiang Province, and Shanghai Municipality.[109] Though one scholar is of the view that Chinese

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cy and Regulatory Framework, 32 ENVTL. L. REP. 11439, 11450 (2002).

103. Richard D. Morgenstern et al., *Emissions Trading to Improve Air Quality in an Industrial City in the People's Republic of China* 1 (Res. for the Future, Discussion Paper, 2004), *available at* http://ageconsearch.umn.edu/bitstream/10782/1/dp040016.pdf.

104. WANG JINNAN ET AL., CHINESE ACAD. FOR ENVTL. PLANNING, SULFUR DIOXIDE EMISSIONS TRADING IN CHINA: PILOTING PROGRAMS AND ITS PERSPECTIVE 6 (2001), *available at* http://www.caep.org.cn/english/paper/A-Framework-of-SO2-Emission-Trading-Program-in-China-2001.pdf.

105. They are Shandong, Shanxi, Jiangsu, and Henan Provinces, and Shanghai, Tianjin and Liuzhou Municipalities and Huaneng Power Group. *See* Wang et al., *supra* note 95, at 36.

106. *Id.*

107. Wang et al., *supra* note 101, at 14-16.

108. The Zhejiang market was the first established in China on November 10, 2007. Lin Boqiang, *Paiwuquan Jiaoyi: Shichanghua de Jineng Jianpai* [Emission Trading Scheme: the Use of Market to Achieve Energy-Saving and Emission Reduction], PEOPLE'S GOVERNMENT OF YUNAN PROVINCE, Dec. 25, 2007, http://www.yn.gov.cn/yunnan,china/76289622883172352/20071225/1161694.html (translated by author).

109. Jiang Ni, *Paiwuquan Jiaoyi: Lilun yu Xianshi Chaju Shenyuan* [Emission Trading: Big Difference Between Theory and Practice],10 ENVTL. ECON. 10, 14 (2007) (translated

ETS entered into a third period characterized by deepened experimentation in 2007,[110] the authors of this paper believe that only the geographic scope of the experiments expanded and no fundamental design changes occurred. The various Chinese ETS programs remain essentially experimental, and no national system exists. The authors of this paper are optimistic, however, both because the experiments are two decades old and because the State Council encouraged an expansion in its 2009 Annual Working Report to the NPC.[111] Though not ready for nationwide implementation, the Central Government is drafting legislation on SO_2 emissions trading for power plants, which is likely to be adopted in 2009.[112] Once that legislation takes effect, China may enter its third phase of emission trading.

C. The Case Study of Jiangsu Province

As it has been claimed that Jiangsu Province is leading the country in air pollutant emissions trading, this section will examine the local legislation and practice in Jiangsu as a case study.[113] Jiangsu Province boasts a relatively advanced economy and thus suffers from high SO_2 emissions and significant acid deposition.[114] In 2000, Beijing mandated a maximum ceiling of one million tons of emissions for the province,[115] and Jiangsu adopted an ETS program to achieve that goal. The legal basis for the program was established when the Jiangsu Province Environmental Protection Bureau (EPB) issued a set of Interim Methods on Administration of Trading of SO_2 Emission Permits for Electricity-generating Plants in Jiangsu Province (Interim Methods).[116] The

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by author).

110. *See* Wang et al., *supra* note 95, at 36.

111. *See Premier Wen Delivers Gov't Work Report*, CHINA VIEW, Mar. 5, 2009, http://news.xinhuanet.com/english/2009-03/05/content_10945972.htm (last visited Apr. 18, 2010); *China Outlines Plans for Energy Saving, Emissions Cut*, CHINA VIEW, Mar. 5, 2005, http://news.xinhuanet.com/english/2009-03/05/content_10947084.htm (last visited Apr. 18, 2010).

112. Wang Shiling, *Paiwuquan Jiaoyi Dianli Xianxing: Zhengce Kuangjia Chengxing Xijie Cun Zhengyi* [Emission Trading Scheme Begins with Electricity-Generating Plants: Policy Has Taken its Shape While Details Not Yet Finalized], 21ST CENTURY BUS. HERALD, Jan. 9, 2009, http://business.sohu.com/20090109/n261653878.shtml.

113. Ruth Greenspan Bell disputes that any reliable information can be gleaned from the experiments. *See* Bell, *supra* note 29, at 15-16, 20.

114. *See* WANG ET AL., *supra* note 104, at 6.

115. State Council, *Liangkongqu Suanyu he Eryanghualiu Wuran Fangzhi Shiwu Jihua* [The Tenth Five-year Plan for the Prevention and Control of Acid Rain and SO_2 Pollution in Two Control Zones], *available at* www.lyhb.cn/longyuan/upload/testg8y72YRq3m.doc (translated by author) [hereinafter Tenth Five-year Plan].

116. *Jiangsusheng Dianli Hangye Eryanghualiu Paiwuquan Jiaoyi Guanli Zanxing Banfa* [Jiangsu Provincial Electric Power Industry Interim Measures on Management of

Interim Methods cover all existing and future power plants situated in two control zones that have chimneys over eighty meters in height,[117] a total of 196 facilities.[118] One ton of SO_2 allocated to a polluting source is defined as one allowance, and trading of SO_2 allowances can be carried out between regulated plants.[119] The EPB, together with the Provincial Economic and Trade Department, determines the total quantity of permissible SO_2 emissions for all plants in Jiangsu Province, after taking into account the overall limit set by SEPA and local air quality conditions.[120] These departments determine the allocation of allowances to each power plant once every five years,[121] with the objective of gradually reducing the total quantity of SO_2 emissions.[122] Sources which have met the discharge standards while staying within their allocated emission allowances receive emissions licenses; those meeting discharge standards but exceeding allocated emission allowances shall receive interim emission licenses and receive a time limit in which to reduce their emissions to the allocated amount.[123] Only after the requirements are met will formal emission licenses be issued.[124] Otherwise, penalties shall be imposed.[125] The initial distribution of emission allowances was made without charge to the sources.[126] Trading of SO_2 emission allowances occurs on a voluntary basis subject to approval of the Provincial EPB and Economic and Trade Department,[127] and a public auction is encouraged.[128] The price for such allowances is assessed and determined by an independent third party, taking into account the cost for SO_2 reductions and market trends.[129] In order to facilitate operation, the environmental protection bureaus of people's governments, at the county level, are required to establish monitoring systems to record the total quantity of SO_2 emitted,[130] while the Provincial EPB is required to maintain supervision of the market.[131]

Sulfur Dioxide Emissions Trading], *available at* http://www.cet.net.cn/web/infodetail.action?id=13 (translated by author) [hereinafter Interim Methods].

117. *Id.* art. 2.
118. WANG ET AL., *supra* note 104, at 7 tbl.1.
119. Interim Methods, *supra* note 116, art. 3.
120. *Id.* art. 7.
121. *Id.* art. 8.
122. *Id.* art. 7.
123. *Id.* art. 14.
124. *Id.* art. 9.
125. *Id.* art. 28.
126. *Id.* art. 10.
127. *Id.* art. 18.
128. *Id.* art. 15.
129. *Id.* art. 17.
130. *Id.* art. 5.
131. *Id.* art. 6.

Several success stories have been reported in Jiangsu. One successful SO_2 allowance trade was carried out in Nantong City in 2001. The Nanjing Acetate Fiber Plant needed SO_2 emission allowances to legally expand their production scale. The Nantong Tianshang Port Power Generation Co., Ltd. had residual allowances after installing modern desulphurization equipment. With facilitation by the Nantong Municipal EPB, the two companies reached an agreement for trading allowances of 300 tons of SO_2 at the price of RMB 250/ton, per annum, for a period of six years.[132] The fiber plant later installed the most advanced technology in mainland China and accordingly earns residual SO_2 emission allowances.[133] Also upon facilitation by the local EPB, the fiber plant sold extra emission allowances to a Japanese company, planning to establish a subsidiary in Nantong.[134]

Another famous case involves the Nanjing Power Plant in Nanjing Municipality. It earned a residual 3000 allowances due to the installation of advanced desulphurization equipment.[135] The Taichang Port Environmental Power Corporation in Taichang, Suzhou Municipality, required 1000 tons of SO_2 emissions for compliance.[136] The two companies reached a sales agreement by which the Tai-chang industry would purchase 1700 allowances at the price of RMB 1.7 million from its Nanjing counterpart starting from July 2003.[137] A third major deal was struck between two power plants in Zhengjiang and Changzhou Municipalities. The deal was concluded in 2004 for the sale of 2,000 allowances per annum at the price of RMB 3 million for a period of five years, from 2006 to 2010.[138]

Recent deals showcasing such governmental facilitation seem to indicate a new model of emission trading. In November 2007, a company in Taixing Municipality wanted to increase its total quantity of SO_2 emission by 406.5 tons per annum and appealed directly to the government for help.[139] The Taixing Municipal EPB decided to allocate emission allowances of 206.4 per annum free of charge to that company, and sell an additional 200 allowances to the company at the price of RMB 1500/ton.[140] The company is re-

132. Miao Kun & Jiang Ni, *Jiangsu Eryanghualiu Paiwuquan Jiaoyi Bulu Jiannan* [Making Progress in SO2 Emissions Trading is Difficult], 10 ENVTL. ECON. 19, 21 (2008).
133. *Id.* at 21.
134. *Id.*
135. *Id.*
136. *Id.*
137. *Id.* at 11.
138. *Id.*
139. *Id.*
140. *Id.*

quired to pay the total sum to a special account annually, which will be used exclusively for regional air pollution prevention and control.[141] The Taixing Municipal EPB obtained the 406.4 allowances through two means: taking back emission allowances due to the closure of other sources and repurchasing emission allowances from other polluters.[142] The involvement of administrative organs is not necessarily a bad thing, if they encourage and facilitate trading between different enterprises in a country which does not yet have a full market economy. Indeed, this model may provide an example of emissions trading with Chinese characteristics.

However, even with government assistance there are many concerns about the ongoing viability of the local programs. An official from the Jiangsu Provincial EPB made several observations about local ETS implementation challenges.[143] First, owing in part to the generous distribution of initial allowances, the market lacks active participants and prices were depressed to only RMB 0.2 per kilo of SO_2 when the first aforementioned deal was completed.[144] Second, in order to cover the cost of investment in desulphurization equipment, the price should stabilize at about RMB 5-6 per kilo of SO_2.[145] Prices have increased, but if prices were to increase to that level it would be difficult for sources to afford the allowances. Third, sources with residual emission allowances often hoard them, saving for future development.[146] Fourth, during the transition period from the Tenth Five-Year Plan Period (2001-2005) to the Eleventh Five-Year Plan Period (2006-2010), almost no deals occurred because emission allowances were readjusted and redistributed, destabilizing the market.[147] Furthermore, a deputy director of the Taixing EPB is not optimistic about the future of the municipal ETS. He worries that industrial investment will leave Taixing for other locales with lower environmental standards if there is not wider geographical application.[148] The same is true for any jurisdiction in China, so nationwide implementation becomes critical as stricter emissions caps are revealed. Without an effective, national ETS regime, it will likely prove impossible for any province to achieve ambitious targets.

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141. *Id.*
142. *Id.* at 22.
143. *Id.* at 11.
144. *Id.*
145. *Id.*
146. *Id.* This also took place in the early U.S. Acid Rain Program Market, but environmentalists were not concerned with this phenomenon because less allowances on the market means, in theory, means less pollution emissions and faster delivery of human and ecosystem health benefits.
147. *Id.* at 11-12.
148. *Id.* at 22.

IV. SUGGESTIONS FOR IMPLEMENTING EMISSIONS TRADING SYSTEMS FROM THE WORLD'S PREMIER TRADING MARKETS

The authors recognize that a nationwide ETS is essential for mainland China to meet its environmental goals and to safeguard the health of its citizens and ecosystems because ETS, provided that it is well administered, offers cheaper and more economically sound environmental results than traditional alternatives. The sooner one is established, the better for the health of the Chinese people. Nonetheless, the HKSAR and Guangdong must seriously pursue their regional response until such a program comes into effect.[149] A comparative review would be helpful for guiding implementation efforts in the Pearl River Delta (PRD) region and across mainland China, as the analysis reveals possible problems and solutions revealed through actual practice. Thus, this section seeks to expound upon the brief overview of the aforementioned Jiangsu program by contextualizing the similarities and differences between the potential Chinese and PRD emissions markets against other leading ETS regimes. For this exercise, the three main mechanisms of a successful ETS, as evinced from international practice, are considered: a firm overall cap, a sustainable emissions allowance market, and robust monitoring and enforcement institutions capable of ensuring compliance. These elements will be discussed in a constitutional context by pitting the hypothetical Chinese and PRD emissions trading schemes against an ETS regime managed by one sovereign, (i.e., the U.S. ARP), and ETS operating in international contexts (i.e., the European Union Emissions Trading System and the Kyoto Protocol).[150] Emphasis is placed upon the similarities between the technical mechanisms shared by all of the ETS regimes to meet their respective environmental goals, regardless of the type of pollutant they seek to regu-

149. A study undertaken in Hong Kong concluded that even relatively minor improvements in local air quality would save over 35,000 hospital bed-days, $131 million to $189.8 for direct health care costs and $ 30.1 million to $57.1 million for productivity losses. *See* Hedley et al., *supra* note 3, at 549-51.

150. These ETS regimes have been selected for important reasons. The U.S. ARP is the oldest and most successful major allowance market in the world and has resulted in steep declines in annual SO_2 and NO_x emissions since its initiation in 1995. U.S. Environmental Protection Agency, Acid Rain and Related Programs: 2008 Environmental Results, http://www.epa.gov/airmarkets/progress/ARP_3.html. The European Union Emission Trading System (EU ETS) represents the world's first large-scale effort to reduce the emissions of carbon dioxide (CO_2) linked to global warming because its reduction commitments have been designed to fulfill the requirements of the Kyoto Protocol. *See* A. Denny Ellerman & Barbara K. Buchner, *The European Union Emissions Trading Scheme: Origins, Allocation, and Early Results*, 1 REV. OF ENVTL. ECON & POL'Y 66, 66-87 (2007). Thus, these two international regimes will be considered to the extent they compliment each other.

late. The elements will be discussed within the U.S. ARP and EU Emissions Trading Scheme (EU ETS) contexts, followed by a synthesis and application to the Chinese contexts, in Part V. To foreshadow, please note that both proposed Chinese regimes presently lack most of these necessary elements.

A. Clear Regulatory Scope and Firm Emissions Cap in International Practice

The most fundamental element of an ETS is the overall emissions cap. This amount is based on the projected cuts needed to achieve a specific environmental goal. Deciding which industries and facilities should be regulated is a matter of substantial political consternation, presenting the first hurdle that ETS architects must clear.

In the United States, Title IV of the Clean Air Act Amendments of 1990 set a goal of reducing SO_2 emissions by ten million tons from 1980 emission levels.[151] The Act targets fossil-fuel burning power plants because they are the largest emitters of SO_2.[152] While the plants were granted allowances based on past fuel usages and statutory emission limitations, the total sum of those allowances was heavily debated during the congressional hearings.[153] Daniel Dudek, a primary architect of the U.S. ARP, argued that the number of initial utilities should be large (Governor Romer felt the number should be at least 100) in order to foster a sustainable trading market.[154] Congress agreed, as the first phase began in 1995 and mandated that 263 units at 110 of the most polluting electric utility plants—those producing over 100 megawatts (MW) of electricity—reduce their total SO_2 emissions by 3.5 million tons.[155] An additional 182 units joined as substitution or

151. CLEAN AIR ACT AMENDMENTS OF 1990 § 401(b), 42 U.S.C. § 7651(b) (2006). Title IV also mandates that NO_x emissions be reduced by two million tons from 1980 levels, but achieves this goal through conventional command and control techniques. *Id.* Thus, only the cap and trade SO_2 provisions will be discussed in this paper.

152. In 2007, electric power generation still accounted for 69% of total U.S. SO_2 emissions. *See* 2007 ARP REPORT, *supra* note 24, at 1.

153. *See* Hirsch, *supra* note 17, at 365-66.

154. *Clean Air Act Amendments of 1989: Hearings on Acid Rain Before the Subcomm. on Environmental Protection of the Comm. on Enironment and Public Works*, 101st Congress 208, 228 (1989) (statements of Daniel J. Dudek, Senior Economist, Environmental Defense Fund and Roy Romer, Governor, State of Colorado).

155. U.S. Environmental Protection Agency, Acid Rain Program, http://www.epa.gov/airmarkets/progsregs/arp/basic.html (last visited Apr. 18, 2010) [hereinafter Acid Rain Program]. These plants were targeted because they emit more than 2.5 pounds of SO_2 per million British Thermal Units (lbs/mmBTu) and are larger than 100 megawatts (MW). *See* 42 U.S.C. § 7651(e), tbl. A (2006); 40 C.F.R. pt. 73, tbl. 1 (2006); Larry B. Parker et al., *Clean Air Act Allowance Trading*, 21 ENVTL. L. 2021, 2027 (1991). Alternative or additional allowance allocations were made for various units, including affected units in Illinois,

compensating units, bringing the total of Phase I regulated units to 445.[156] The federal EPA allocated allowances directly to those sources based on an equation balancing heat input with the source's baseline fossil fuel consumption between 1985 and 1987.[157] Phase II began in the year 2000. The regulatory scope was expanded to include over 2,000 smaller plants that produce over 25 MW of electricity.[158] The EPA simultaneously tightened the emissions ceiling to 9.5 million tons.[159] Plants established after the year 2000 would not receive allowance allocations from the EPA, thereby forcing them to purchase allowances from existing units, further diluting the allowance pool.[160] In 2010 the cap will be reduced again to its final objective—8.95 million tons—a figure representing about half the 1980 total of 17.3 million tons.[161] Thanks in large part to the ease of implementation and enforcement within a closed, domestic system, that goal was achieved three years in advance of the projected deadline.[162]

The European Union ETS regime has had more difficulty achieving results. It seeks to regulate a far more demanding set of variables, including over 11,500 carbon-emitting sources,[163] collectively responsible for over 40% of the EU's total greenhouse gas emissions.[164] This requires regulating several diverse industrial sectors,[165] encompassing more than 11,500 sources, emitting over two billion metric tons of CO_2.[166] Significantly, the value of the allowances distributed under the EU ETS is equal to

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Indiana, and Ohio, which were allocated a pro rata share of 200,000 additional allowances each year from 1995 to 1999. 42 U.S.C. § 7651(e), tbl. A.

156. U.S. Environmental Protection Agency, SO_2 Reductions and Allowance Trading Under the Acid Rain Program, http://www.epa.gov/airmarkets/progsregs/arp/s02.html (last visited Apr. 18, 2010).

157. Fact Sheet, *supra* note 18.

158. Phase II encompassed smaller and cleaner plants that range between 25 MWe and 75 MWe. *See* 42 U.S.C. §§ 4651d(b)-(f), (h), (j).

159. U.S. Environmental Protection Agency, Cap and Trade: Acid Rain Program Basics, *available at* http://www.epa.gov/capandtrade/documents/arbasics.pdf.

160. *See* 42 U.S.C. § 4651b(e).

161. *See* 2007 ARP REPORT, *supra* note 24, at 5.

162. *Id.* at 10.

163. *See* Ellerman & Buchner, *supra* note 150, at 68. The EU ETS is also larger in terms of sheer pollution regulated: pre-policy emissions in the EU ETS were over two billion metric tons of CO_2, versus sixteen million tons of SO_2 regulated by the U.S. ARP. *Id.*

164. Press Release, European Union, Questions and Answers on the Commission's Proposal to Revise the EU Emissions Trading System, MEMO/08/35 (Jan. 23, 2008), *available at* http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/35. Consider this as opposed to the U.S. ARP regulating fewer than 3,000 sources. Ellerman & Buchner, *supra* note 150, at 68.

165. These include mineral and oil refineries, coke ovens, smelting, and pulp processing facilities. *Id.* at 72.

166. *Id.* at 68.

about $41 billion versus about $5 billion under the U.S. ARP.[167] As in the U.S., the sum of the allowances represents the maximum pollutant emission level mandated by the cap, but the EU ETS countries must design their measures to meet the obligations recorded in the Kyoto Protocol.[168] Yet, it is not these logistical burdens, but a decentralized structure which has frustrated implementation. Whereas the initial cap fixing process in the U.S. is negotiated directly between the EPA and individual source units, the initial process was tripartite in Europe, with EU member state governments acting as intermediaries between the European Commission and the sources.[169] Responsibility was decentralized, as each member state was permitted to designate its own cap ceiling and determine how the allocations would be distributed to sources.[170] The European Commission would approve the proposals so long as the amount is the lesser of either the so-called "business-as-usual" emissions, or a level that would not preclude achievement of the member state's 2008–2012 Kyoto obligations.[171] However, this arrangement was unsuccessful in preventing an increase in overall emissions during the early years of EU ETS operation.[172]

Like the U.S. ARP, the EU ETS was initiated in two phases. Independent auditing concluded that both Phase I (2005 – 2007) and Phase II (2008-2012) were over-allocated to meet Kyoto obligations.[173] Thus, in January of 2008, the European Commission proposed that centralized planning and allocation responsibility be conferred to an EU authority.[174] This change will be implemented in 2013, when the third trading period begins.[175] Indeed, the over-

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167. Calculated at a rate of €15/metric ton and an exchange rate of U.S. $1.25 to €1.00. *Id.*

168. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162 [hereinafter Kyoto Protocol].

169. Ellerman & Buchner, *supra* note 150, at 70.

170. These are called National Allocation Plans, or NAPs. ALYSSA GILBERT ET AL., ECOFYS UK, ANALYSIS OF THE NATIONAL ALLOCATION PLANS FOR THE EU EMISSIONS TRADING SCHEME 2 (2004), *available at* http://www.ecofys.co.uk/com/publications/documents/Interim_Report_NAP_Evaluation_180804.pdf.

171. Ellerman & Buchner, *supra* note 150, at 71.

172. *Id.* at 83.

173. CLIMATE ACTION NETWORK EUROPE, NATIONAL ALLOCATION PLANS 2005-7: DO THEY DELIVER? KEY LESSONS FOR PHASE II OF THE EU ETS: SUMMARY FOR POLICY-MAKERS 2, 5 (2006), *available at* http://www.climnet.org/resources/archive/doc_download/1151-napsreportsummary0306.html. (stating that the NGO Climate Action Network called the EU ETS caps a "major disappointment," arguing that only two of the twenty-five EU states (UK and Germany) required sources to make necessary reductions); MAX RATHMAN ET AL., ECOFYS UK, INITIAL ASSESSMENT OF THE NATIONAL ALLOCATION PLANS FOR PHASE II OF THE EU EMISSIONS TRADING SCHEME 1 (2006), *available at* http://www.ecofys.com/com/publications/documents/Ecofys_Summary_InitialNAP2_Assessment.pdf.

174. Press Release, European Union, *supra* note 164.

175. Press Release, European Union, Questions and Answers on the Revised EU

allocation of permits tolerated in a confederative structure resulted in a catastrophic pricing failure that will be further discussed in the next section.[176] The lesson to be learned from this exercise is that centralized, long-term cap fixing, is essential to a successful ETS program.

B. Market Mechanisms in International Practice

This section will focus on the more technical aspects of ETS market functioning. The privilege to pollute must be securitized in a manner that creates incentive for sources to reduce emissions while allowing the flexibility to tailor their own compliance methods. The basic market mechanisms of the U.S. ARP and EU ETS will be briefly introduced herein, including major implementation problems in their respective settings.

In the United States, allowance holders have four defined rights (offsetting, bubbling, netting, and banking) to choose from when tailoring an effective compliance strategy and disposing of their allowances.[177] Sources reducing emissions below their allowance level may sell or trade the remainder of their allowances to any interested party. Furthermore, the EPA oversees an annual auction of emissions allowances to help generate and maintain a market, signal price information, and ensure that new sources have access to a pool of allowances once the final cap is achieved.[178]

Emissions Trading System, MEMO/08/796 (Dec. 17, 2008), *available at* http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/796.

176. Almost all stakeholders supported a more harmonized cap-setting approach, thus illustrating an extremely broad consensus to improve cap setting. *See* EUROPEAN CLIMATE CHANGE PROGRAMME, FINAL REPORT OF THE 2ND MEETING OF THE ECCP WORKING GROUP ON EMISSIONS TRADING ON THE REVIEW OF THE EU ETS ON ROBUST COMPLIANCE AND ENFORCEMENT 2 (2007), *available at* http://ec.europa.eu/environment/climat/emission/pdf/070426.pdf [hereinafter ECCP FINAL REPORT].

177. Emissions Trading Policy Statement: General Principles for Creation, Banking and Use of Emission Reduction Credits, 51 Fed. Reg. 43,815 (Dec. 4,1986); Hirsch, *supra* note 17, at 360-61. These present a variety of options enabling the operator to tailor a flexible emissions reduction strategy. First, "offsetting" allows operators who are unsuccessful in reducing their emissions below required levels to purchase units from other sources, that have reduced their levels. *Id.* at 360. Second, "bubbling" allows plant operators managing a larger facility to increase emissions at one source in exchange for compensating decreases of emissions at other sources within the same plant. *Id.* Third, "netting" occurs when an expanding or modernizing source will not be subject to the administrative procedures for new plants if the source compensates for added emissions by reducing pollution from other existing emission sources within the same plant. *Id.* at 361. Finally, "banking" permits a source that emits less than their quota to keep its excess emissions reductions for future use. *Id.* at 360-61.

178. 42 U.S.C. § 7651o (2008). The Chicago Board of Trade has conducted that auction for the EPA since 1993. U.S. Environmental Protection Agency, Acid Rain Program Allowance Auction Fact Sheet, http://www.epa.gov/airmarkt/trading/factsheet-auction.html (last visited Apr. 18, 2010). Private sellers may also sell or purchase allowances at the EPA auction, but unlike the allowances that the EPA offers, private sellers may specify a minimum

Any person, including brokers or environmental groups, may participate in the market.[179]

It is worth noting that the U.S. allowance market, like that in Jiangsu, did not develop immediately. Only 12 utilities participated in 21 trades of 5,000 or more allowances in the period between April 1992 and September 1994.[180] The market began to pick up in 1995,[181] and blossomed with the introduction of online transfers in December 2001.[182] While the internet obviously lowered transaction costs and facilitated market growth, possible reasons why the allowance market remained anemic between 1992 and 1995 are worth investigating. First, it has been suggested that Congress or the EPA and industry may have over-allocated or otherwise overvalued the projected cost of emissions reductions.[183] Second, market uncertainty played a role, as the initial value of a SO_2 allowance was difficult to determine in comparison to the relatively stable prices of coal and scrubbers.[184] Third, sources were unsure how to incorporate the allowances into their ratemaking processes. After some petitioning, the Federal Energy Regulatory Commission issued a 1994 policy statement clarifying how to include the cost of emissions allowances in ratemaking for state utility commissions to achieve a fair rate of return.[185] Finally, the authors note that the early U.S. ARP was an experiment of unprecedented scale.[186] Participants may have experienced trepidation en-

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sale price. *Id.*

179. U.S. ENVTL. PROT. AGENCY, EPA430/F-92/017, ACID RAIN PROGRAM: ALLOWANCE AUCTIONS AND DIRECT SALES 2 (1992).

180. *See* U.S. GEN. ACCOUNTING OFFICE, GAO/RCED-95-30, AIR POLLUTION: ALLOWANCE TRADING OFFERS AN OPPORTUNITY TO REDUCE EMISSIONS AT LESS COST 30 (1994), *available at* http://www.gao.gov/archive/1995/rc95030.pdf, *cited in* Rauch, *supra* note 19, at 338 [hereinafter GAO REPORT].

181. "The number of private transfers of emission allowances increased from almost zero in 1994 to more than 75 million in 1997." Rauch, *supra* note 19, at 338.

182. By 2007, nearly 4,700 private transfers of roughly 16.9 million allowances were recorded in the EPA Allowance Tracking System. 2007 ARP REPORT, *supra* note 24, at 11. About 9.1 million (54%) were transferred in economically significant transactions (i.e., "arms-length" transactions between economically unrelated parties). *Id.* at 12. Over 99% of those were conducted through the online transfer system. *Id.* at 11. Allowance transfers are posted and updated daily at http://www.epa.gov/airmarkets (last visited Apr. 18, 2010).

183. *See* Rauch, *supra* note 19, at 339.

184. Allowance prices dipped as the market prices of low-sulfur coal and industrial scrubbers dropped between 1990 and 1995, but rebounded as the cap was drawn down. Rauch, *supra* note 19, at 340. Indeed, the imposition of the 1990 amendments may have jump-started the market for cleaner coal and more efficient scrubbers, which is a positive side-effect. *See* GAO REPORT, *supra* note 180, at 28-29.

185. Policy Statement and Interim Rule Regarding Ratemaking Treatment of the Cost of Emissions Allowances in Coordination Rates, 59 Fed. Reg. 65,930 (Dec. 22, 1994) (to be codified at 18 C.F.R. pts. 2, 35).

186. As Rauch stated, "[a]lthough a number of trading programs have been developed in several countries, the Acid Rain Program in the U.S. is still the most comprehensive and complex allowance market." Rauch, *supra* note 19, at 309.

tering an uncertain new market, but the success of this national ETS means that new systems should not be viewed with undue suspicion.

A second major problem with the implementation of the U.S. market was unforeseen and undesirable geographic pollution redistribution. Midwestern industries enthusiastically purchased residual allowances, and the corresponding increase in emissions filled the wind with pollutants that ultimately deposited in the Northeast.[187] The continental United States, including the Great Lakes and New England region, are at a latitude where winds blow towards the poles in a generally west to east direction.[188] The EPA attempted to address this phenomenon by authoring the Clean Air Interstate Rule (CAIR), seeking to further slash the SO_2 emissions cap in 28 eastern states to a sum of just 2.5 million tons at full implementation, 73% below 2003 emissions levels.[189] However, the proposed CAIR was voided in litigation.[190] Until a proper legal solution can be drafted,[191] downwind states must rely on a traditional statutory right to petition for relief from unlawful interstate pollution.[192]

EU ETS allowance holders possess the same range of options as US ARP allowance holders to operate in the marketplace and tailor their compliance strategies, and were granted more options

187. New York-based utility LILCO, for example, "sold more than 67,000 tons of pollution rights directly to Midwest companies, in addition to the 79,980 tons sold to brokers." Mike Vogel, *Retiring of Emission 'Credits' to Speed Battle on Acid-Rain*, BUFFALO NEWS, Aug. 27, 1997, at C16.

188. The strongest westerly winds in the middle latitudes can come in the "Roaring Forties" between 40 and 50 degrees latitude. Heather Catchpole, Roaring Forties, ABC Science, http://www.abc.net.au/science/articles/2007/09/20/2038604.htm (last visited Apr. 18, 2010) Although much stronger in the southern hemisphere than the northern, the heavily industrialized U.S. Great Lakes region is mostly within this region of the Northern Hemisphere. *See also* Rauch, *supra* note 19, at 350 ("Polluted air drifts with normal weather patterns from sources in Midwestern and Southern states over to the most populated areas of the East Coast.").

189. U.S. Environmental Protection Agency, Clean Air Interstate Rule Basic Information, http://www.epa.gov/CAIR/basic.html (last visited Apr. 12, 2010).

190. North Carolina v. Envtl. Prot. Agency, 531 F.3d 896, 901 (D.C. Cir. 2008) (per curiam) (the Court held that the EPA's approach—regionwide caps with no state-specific quantitative contribution determinations or emissions requirements—is fundamentally flawed. Therefore, the trading program was declared unlawful because it did not connect states' emissions reductions to any measure of their own contributions).

191. Several efforts by New York to pass laws prohibiting in-state sources from selling permits to Midwestern companies failed legal scrutiny under the supremacy clause of the U.S. Constitution. For example, in 1998, LILCO signed an agreement with the New York Governor's Office to not sell its excess SO_2 credits to fifteen upwind states. *See* Rauch, *supra* note 19, at 342-43. In the case of China, given that it is a unitary state and the Ministry of Environmental Protection and local governments have been given legislative authority, a similar local legislation is unlikely to encounter the same challenge as in the U.S.. Furthermore, a departmental legislation enacted by the Ministry of Environmental Protection can prevent such a constitutional challenge.

192. 42 U.S.C. § 7426 (2006).

through ascension to the Kyoto Protocol. The so-called "Linking Directive" allows EU ETS sources to apply a certain amount of allowances earned from Kyoto innovations such as Joint Implementation projects[193] and the Clean Development Mechanism (CDM)[194] to meet their targets. The CDM allows industrialized countries to invest in projects that reduce emissions in developing countries as an alternative to more expensive domestic reductions.[195] The architects of the EU ETS ensured that all of these allowances would be tradable, with one EU Certified Emissions Reduction (CER, or carbon credit) from the CDM mechanism and one Kyoto allowance unit each authorizing one ton of CO_2 emissions.[196] Thus, the EU ETS market is both a regional marketplace and an attempt to integrate the EU into a global ETS at once.

Despite these innovations, the EU ETS's initially decentralized command structure prevented a sustainable market from forming. The price of allowances had increased to a peak level of about €30 per ton CO_2 in April 2006,[197] but imploded in May 2006 to €10/ton when an announcement confirming that an absence of detailed emission data when setting the Phase I caps resulted in countries granting their industrial sources generous emission caps.[198] This price spiraled down to a mere €0.03 by December 2007.[199] The

193. *See* Kyoto Protocol, *supra* note 168, art.6.

194. *Id.* art. 12.

195. *Id.* "A CDM project activity might involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets." United Nations Framework Convention on Climate Change, Clean Development Mechanism, http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php.

196. *See* Council Directive 2004/101, 2004 O.J. (L 338) 18 (EC). *See also* Kyoto Protocol, *supra* note 168, art. 12.

197. Colin A. Scholes, *Putting a Price on Carbon*, CHEMISTRY IN AUSTRALIA, Feb. 2010, at 28, 29, *available at* www.raci.org.au/chemaust/docs/pdf/2010/CiA_Scholes_feb_2010.pdf (last visited Apr. 12, 2010); *Historic Prices: EUA OTC Assessment*, POINT CARBON, Sept. 4, 2009 (on file with author);.

198. *Historic Prices: EUA OTC Assessment*, *supra* note 197; *see* Michael Grubb & Karsten Neuhoff, *Allocation and Competitiveness in the EU Emissions Trading Scheme: Policy Overview*, 6 CLIMATE POL'Y 7, 19 (2006). "The lack of installation-specific emissions data was perhaps the biggest problem that Member States faced in the allocation process." Frank Convery et al., *The European Carbon Market in Action: Lessons From The First Trading Period, Interim Report*, 12 (Center for Energy and Envtl Policy Research, Interim Report No. 08-002, Mar. 2008).

199. Scholes, *supra* note 197, at 29; *Historic Prices: EUA OTC Assessment*, *supra* note 197. Meanwhile, according to the EPA, the 2008 U.S. allowance auction sale prices were "very much in line with expectations for this trading market." 2007 ARP REPORT, *supra* note 24, at 12. The average weighted price per allowance was $389.91, marking a major increase from where they were a decade ago, although they tumbled to $69.74 in 2009 with the deepening of the subprime financial crisis. U.S. Environmental Protection Agency, Annual Auction Results, http://www.epa.gov/airmarkets/trading/auction.html (follow "EPA Allowance

collapse demonstrates that an ETS market operates just as any private shares market, with jittery investors and hypersensitivity to trend indicators. An announcement by a small bloc of minor nations or a single large nation that its goals are insufficiently ambitious or that it will not fulfill its obligations can send the market into spasms, perhaps fatal ones. Given the catastrophic response, it is not surprising that for the EU countries for which data is available (all 27 member states minus Romania, Bulgaria and Malta), total CO_2 emissions actually increased by 1.9% between 2005 and 2007.[200] Such a contingency must be prevented in a transboundary environment, such as that between mainland China and the SARs. Indeed, in 2009 the EU centralized carbon credit allocation authority.[201] There are two very crucial lessons here: any trading scheme requires centralized authority and a solid data base when designing it; hastened or uneven implementation will facilitate over-allocation, as policymakers are averse to high economic costs.

C. Monitoring and Enforcement in International Practice

ETS must be accompanied by aggressive tracking and enforcement mechanisms to assure that the desired results are achieved. The U.S. ARP and Kyoto Regime both recognize the necessity of centralized functioning. It is feared that uneven enforcement will occur across the European Union's member states, adding to allowance market instability. Any transboundary regime must incorporate centralized monitoring and enforcement mechanisms to be effective.

The U.S. EPA mandates detailed continuous emissions monitoring systems (CEMS) be installed in the smoke stacks of regulated utilities.[202] The U.S. ARP requires an accounting of every ton of emissions released from every unit, and hourly emissions reports must be submitted quarterly to the EPA.[203] There are progressively stringent substitute data requirements for data loss to ensure continuous reporting.[204] At the end of the year an account-

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Auction Results" hyperlink for each respective year, then follow "Results: summary of total bids, winning bids, and prices" hyperlink) (last visited Apr. 18, 2009).

200. *See* Press Release, European Union, Emissions Trading: 2007 Verified Emissions from EU ETS Businesses, IP/08/787 (May 23, 2008), *available at* http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/787.

201. Council Directive 2009/29, ¶ 14, 2009 O.J. (L 140) 63 (EC).

202. 40 C.F.R. pt. 75 (2009); 2007 ARP REPORT, *supra* note 24, at 22; U.S. Environmental Protection Agency, Continuous Emission Monitoring - Information, Guidance, etc., http://www.epa.gov/ttn/emc/cem.html (last visited Apr. 18, 2010).

203. Acid Rain Program, *supra* note 155.

204. *Id.*

ing occurs. Every unit is given a 60 day grace period in which it must purchase SO_2 allowances for every unit expended over its allotment.[205] If unsuccessful, the EPA automatically levies a fee assessed as equal to $2,000 in 1990 dollars, adjusted for inflation (i.e. $3,273 in 2007, a price significantly higher than the cost of an allowance), as well as offsets of future allowances.[206] The cost of penalties must be greater than cost of allowances or they will not have a deterrent effect. Compliance has been estimated at over 99% for the SO_2 program, while the NO_x program has met its goal every year since 2000.[207]

In the European Union, as under the U.S. ARP, pollutant sources must monitor and annually report their CO_2 emissions then redeem an amount of allowances equivalent to their emissions in that year.[208] Michael Wara, a Stanford Law School professor, has criticized the program for not requiring businesses to use monitoring instrumentation, but rather allowing them to determine their carbon emissions by internal calculation.[209] More frequent reporting, i.e. quarterly reports instead of annual ones, have been proposed,[210] though nothing nearly as stringent as the U.S. ARP's continual monitoring standard. Opponents point to costly administrative burdens,[211] but the U.S. and Finland use automatic, IT-based ways, to collect and distribute information efficiently. Some member state governments have stated that they favor a harmonized monitoring approach, based on EU regulation, because a centralized agency is perceived as apolitical, independent, and authoritative.[212] At present, it is feared that a number of member states will impose sanctions in the case of non-compliance, while others will not.[213] The EU ETS needs proper legal instruments for monitoring and enforcement, particularly in light of linking the EU ETS with other emissions trading schemes.

There are more stringent responsibilities for the EU ETS member states under the overlapping Kyoto regime. Recognizing

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205. *Id.*

206. 2007 ARP REPORT, *supra* note 24, at 11; Acid Rain Program, *supra* note 155.

207. 2007 ARP REPORT, *supra* note 24, at 11, 22.

208. These rules are promulgated in the EU Monitoring and Reporting Guidelines (MRG). Commission Decision 2007/589, 2007 O.J. (L 229) 1 (EC), Article 14 of the ET Directive required the Commission to elaborate on guidelines for the monitoring and reporting of greenhouse gas emissions under the ETS, which it did in January 2004, requiring Member States to ensure that emissions are monitored in accordance with these guidelines. Council Directive 2003/87, art. 14, 2003 O.J. (L 275) 32 (EC).

209. *See* Jennifer Barone, *The Carbon Trap*, DISCOVER, Dec. 2008, at 71, 71-72.

210. ECCP FINAL REPORT, *supra* note 176, at 2.

211. *See id.*

212. *Id.* at 3.

213. *Id.* at 8.

the need for logistical centralization, a global registry system is maintained at the UN Climate Change Secretariat to track and record every transaction.[214] Also, a Kyoto Compliance Committee exists to facilitate and enforce protocol compliance.[215] The enforcement branch has the responsibility of determining consequences for delinquent Parties.[216] If a state has exceeded its assigned emissions allowance it is forced to make up the difference, plus an additional deduction of 30% in the next commitment period.[217] Furthermore, the delinquent state must submit a plan of action to achieve compliance and the eligibility of the state to make transfers is suspended.[218] While strong in theory these mechanisms have never yet been tested, as the first Kyoto compliance period will end in 2012. They may never be, as the 2009 UN Climate Change Conference at Copenhagen fell short of expectations..[219]

From the brief discussion above, several general rules can be extracted. First, monitoring should be uniform to preserve program integrity. Second, more frequent reporting is better than none at all. Third, IT solutions are a cost-effective and reliable way to collect unbiased monitoring data. Fourth, sanctions will likely not be effective under a decentralized regime if each jurisdiction is responsible for separate determinations. There is fear that the EU ETS regime will not be effective in this regard, while it is the most important hallmark of the U.S. ARP. Thus, it has oft been proposed that the EU incorporate its monitoring and enforcement provisions into a revised EU Directive and create an agency to oversee these functions.[220] Kyoto has centralized functions, but whether they are used is yet to be seen. These should all be considered in the Chinese context, especially in the transboundary setting between the Mainland and the SARs.

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214. United Nations Framework Convention on Climate Change, Registry Systems Under the Kyoto Protocol, http://unfccc.int/kyoto_protocol/registry_systems/items/2723.php (last visited Apr. 18, 2010).

215. United Nations Framework Convention on Climate Change, An Introduction to the Kyoto Protocol Compliance Mechanism, http://unfccc.int/kyoto_protocol/compliance/introduction/items/3024.php (last visited Apr. 18 2010).

216. *Id.*

217. *Id.*

218. *Id.*

219. The UN Copenhagen Climate Change Conference took place in Copenhagen, Denmark in December 2009. Despite two years of advance diplomacy, the Parties failed to produce a binding post-2012 regime for mitigating carbon emissions. Arthur Max, *Post-Copenhagen Climate Talks Begin Amid Discord*, ASSOCIATED PRESS, Apr. 9, 2010, http://www.nytimes.com/aponline/2010/04/09/world/AP-Climate.html?scp=10&sq=copenhagen&st=cse.

220. *See* ECCP FINAL REPORT, *supra* note 176, at 3.

V. THE CHINESE CONTEXTS

At present, plans for a national ETS are being discussed, while the HKSAR and Guangdong are developing a regional ETS program. The existing cap fixing, market mechanisms, and enforcement measures are insufficient to sustain an ETS in either Chinese context.

A. Current Status of National Regulatory Framework for an ETS in Mainland China

There is significant concern that mainland Chinese institutions are presently incapable and/or unwilling of managing a complex ETS mechanism. Ruth Greenspan Bell, among others, has critiqued imprudent and overly zealous attempts to install ETS in developing countries. She aptly points out that:

> Institutional inadequacies such as low functioning legal systems, historical experience (or inexperience) with markets, distorting and often institutionalised corruption, and public acceptance certainly can be fixed. But changing these fundamentals can be a long and arduous process. Those who advise governments to adopt reforms for which the institutional basis does not yet exist put the cart before the horse. . . .[221]

She suggests that a better approach is to find examples of small but promising traditional efforts that seem to be working and building on them, charging that insincere efforts diminish the environmental cause.[222] The authors prefer that the Chinese move forward with their national ETS efforts in concert with stringent traditional regulatory approaches, both because China has been actively engaged in a process of institution-building and because the scope of the environmental problem is so large and critical. Additionally, the shield of institutional inadequacy cannot be allowed to serve as a permanent excuse.

On the institutional front, China has made substantial progress since the rise of Deng Xiaoping, thirty years ago, marked the beginning of institutional reforms and the gradual move to a market economy.[223] Three stock markets now operate in China: the

221. Bell, *supra* note 29, at 4.
222. *See id.*
223. CHOW, *supra* note 49, at 18, 32-38.

Shanghai and Shenzhen Stock Exchanges (both since 1990), and the Hong Kong Stock Exchange. The experience gained in these large markets has provided some practical basis for emission trading. Though historically suspect, there are solid trends in accounting and tax collection practices on the Mainland.[224] Reform of state enterprises has divided representation of state ownership between central and local governments, and also transformed them into quasi-limited liability companies.[225] Many are also publicly listed now, especially power companies. Courts are more active, increasingly aggrandizing powers in subtle ways.[226] Yet, there remains room for institutional improvement. Most importantly, it is highly improbable that a local government would strictly enforce environmental laws against a local industry if that threatened its operation. The health and well-being of the people should be a strong consideration, but the lack of a free press restrains transparency and public access. However, reporting of environmental issues enjoys a larger zone of freedom than other spheres.[227] Thus, implementation and compliance of a nationwide ETS may still face significant challenges in China but should not be rejected out of hand if complementing a traditional regime.

The APPCL indicates that most of China's efforts are conducted under the traditional approach; emission trading is not formally written into the law. Thus, the experiment is proceeding cautiously. The Ministry of Environmental Protection (MEP) and the local governments must each play important roles to be successful under the APPCL, as amended in 2000.[228] Specifically, the

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224. For example, China has begun using advanced technology to combat tax evasion. *China Battles Tax Evasion with Help of Computers*, PEOPLE'S DAILY, Dec. 4, 2000, *available at* http://english.peopledaily.com.cn/english/200012/04/eng20001204_56879.html.

225. *See* Frank Xianfeng Huang, *The Path to Clarity: Development of Property Rights in China*, 17 COLUM. J. ASIAN L. 191, 209 (2004). By the end of 2004, state-owned holding companies controlled over 71% of publicly listed companies in mainland China. Organization for Economic Co-operation and Development, Organisation for Economic Co-operation and Development [OECD], *Policy Dialogue on Corporate Governance in China: Overview of Governance of State-owned Listed Companies in China*, at 1, DRC/ERI-OECD 2005, (May 19, 2005), *available at* http://www.oecd.org/dataoecd/14/6/34974067.pdf.

226. A landmark example is the judicial interpretation issued by the Supreme People's Court in 2001, discussing whether constitutional provisions can be invoked in a civil case. That interpretation has been hailed by many Chinese scholars as China's *Marbury v. Madison*. 5 U.S. 137 (1803). Shen Kui, *Is It the Beginning of the Era of the Rule of the Constitution? Reinterpreting China's "First Constitutional Case"*, 12 PAC. RIM L. & POL'Y J. 199, 199 (2003) (Yuping Liu, trans.). *See generally* Chris X. Lin, *A Quiet Revolution: An Overview of China's Judicial Reform*, 4 ASIAN-PAC. L. & POL'Y J. 255 (2003) (discussing judicial reform in China).

227. *See* Randall Peerenboom, *Assessing Human Rights in China: Why the Double Standard?*, 38 CORNELL INT'L L.J. 71, 103-110 (2005) (discussing human rights, including freedom of the press).

228. *See* Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law], art. 2.

Central People's Government is responsible for setting national air quality standards, which it has done.[229] Article 15 of the APPCL gives authority to both the central and provincial governments to set caps on air pollutants emissions for (1) regions where air quality has not met prescribed standards, and (2) acid rain control zones and SO_2 pollution control zones designated by the State Council.[230] Thus, the MEP can designate certain areas where there is acid rain or serious SO_2 pollution after obtaining approval from the State Council.[231] The MEP is also responsible for promulgating measures to gradually reduce the total quantity of air pollutants,[232] while local governments must implement that legislation.[233] For cities which do not meet specified air quality standards, time limits may be imposed by either the State Council or the MEP to create implementation plans and comply.[234] Although the APPCL does not explicitly provide that there will be a national ETS, it is observed that the total emissions cap as well as a licensing system for air pollutants—two of the essential bases for an ETS—already exist in mainland China.

China first attempted to limit the total quantity of national SO_2 emissions under the Tenth Five-Year Plan for Environmental Protection.[235] Chapter 3 of the APPCL, as amended in 2000, focuses attention on SO_2 emitted from all newly established or expanded power plants and other large to medium-sized enterprises.[236] Indeed, SO_2 rich coal is the principal energy source in China, used to meet approximately 69% of the nation's total energy needs.[237] Two key objectives were set: first, the release of SO_2 should meet new emissions standards and, second, that by 2010 the total quantity of SO_2 emission should be limited to 2000 le-

229. *Id.* art. 7. Local governments can also set their own standards, provided that the local air quality standards are more stringent than the national standards. *Id.*

230. The Acid Rain Control Zones consist of areas with average annual pH values for precipitation less than or equal to 4.5, sulfate deposition greater than the critical load, and high SO_2 emissions. The SO_2 Pollution Control Zones consist of areas with daily and annual average ambient SO_2 concentrations exceeding standards, and high SO_2 emissions. These areas receive priority for investment and management to control emissions. WANG ET AL., *supra* note 104, at 3. Furthermore, the State Council has authority, under Article 17, to designate important cities for air pollution prevention and control. Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law], art. 17.

231. *Id.* art. 18.

232. *Id.* art. 3.

233. *Id.* art. 4.

234. *Id.* art. 17.

235. Tenth Five-year Plan, *supra* note 115.

236. *See* Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law], arts. 24-29.

237. INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 249 (2002), *available at* http://www.iea.org/textbase/nppdf/free/2000/weo2002.pdf.

vels.[238] China's total SO_2 emission in 2000 was 19,950,000 tons,[239] of which 13,160,000 tons were emitted in two designated types of concentrated pollution zones—one for SO_2, the other for acid rain.[240] The stated target was bringing the total quantity of SO_2 emissions down by 10% nationwide, and by 20% in the urgent control zones, by 2005.[241] China failed to achieve the stated targets, as SO_2 emissions increased by 27.8% to 25,490,000 tons at the end of 2005.[242] The Eleventh Five-Year Plan for National Environmental Protection states a new target: bringing the total quantity of SO_2 emissions down by 10%, nationwide, compared to 2005 emissions.[243] The provinces have no power to override these limitations once set.[244] However, a key reason for the success of the U.S. ARP is that planning was conducted well in advance; sources had from the program's adoption in 1990 and initial implementation in 1995 to prepare for the 2010 goal.[245] China's legislative method of devising five-year plans that include the planning, implementation, and goals makes achievement daunting and will serve to constrain market formation. Thus, China should begin devising its ETS goals based on a longer-term framework.

Most of the other market implementation problems discussed in the international context should not apply to China, if the country has learned from past experience. The authors anticipate that a well-planned and administered Chinese ETS market would be very fast to develop from sheer size and centralized administration

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238. In addition, by 2010 the concentration of SO_2 in cities should meet national environmental air quality standards and, in Acid Rain Control Zones, the occurrence of rain with a pH of below 4.5 should be significantly reduced. Tenth Five-year Plan, *supra* note 115, § III (SO_2 Emissions Control Targets) (translated by author).

239. *Id.* at § III (The Two Control Zones, Acid Rain and SO_2 Emissions – The Basic Situation) (translated by author).

240. *Id.* at § II (Background) (translated by author).

241. Wang Xin-Fang, Director of the State Environmental Protection Administration, *Guojia Huanjing Baohu shiwu Jihua* [Explanations on the Tenth Five-year Plan for National Environmental Protection], Jan. 11, 2002, http://big5.mep.gov.cn/gate/big5/www.zhb.gov.cn/epi-sepa/gzdt/wenzhang/y13.htm.

242. State Council General Office, *Guojia Huanjing Baohu Shiyiwu Guihua* [The Eleventh Five-year Plan for National Environmental Protection], Nov. 26, 2007, http://www.china.com.cn/policy/txt/2007-11/26/content_9293694.htm.

243. *Id.*

244. The Chinese Provinces are lower in the Chinese state structure than the central, national level government seated in Beijing. XIAN FA [Constitution] art. 30, 62 (12). The National People's Congress in Beijing is the "highest organ of state power." XIAN FA [Constitution] art. 57.

245. Title IV of the Clean Air Act, as adopted in 1990, set an ultimate goal of reducing annual SO_2 emissions by 10 million tons below 1980 levels. CLEAN AIR ACT AMENDMENTS OF 1990 § 401(b), 42 U.S.C. § 7651(b) (2006). A two-phase implementation program was designed for fossil fuel-fired power plants, initializing in 1995 and 2000, respectively. As such, the Phase I sources had five years to prepare for 1995; Phase II sources had ten years. *See* Acid Rain Program, *supra* note 155.

if made a national priority. However, the architects of a Chinese ETS should be very sensitive that free trade of allowances may permit undesirable pollution redistribution. For example, industrial interests in Guangdong would likely seek to purchase additional permits and release more pollutants, thereby exacerbating the southeastern flow toward Hong Kong. Whereas westerly winds blow across the middle latitudes of the Earth, easterly winds dominate the flow pattern across the poles and tropics.[246] Hong Kong, Macau, and Guangzhou are within the tropical zone, while large parts of middle and northern China are subject to westerly winds.[247] Likewise, the industrial Manchuria region may find its problem multiplied as New England did if local sources sell their allowances to sources in western longitudes. The best conceivable way to prevent this phenomenon from occurring would be to institute very strict national maximum emissions caps in concert with more stringent local and regional requirements. Tight emissions caps encourage sources to cut emissions through cleaner technology, rather than seek to cover their emissions with allowances. In addition, a Kyoto-inspired CDM mechanism may thrive in China, given the great developmental and resource inequality across the nation, provided it is not abused.[248]

Monitoring and enforcement issues are not particularly tricky in the Mainland context provided the requisite political will exists. China currently has a SO_2 emission and measurement reporting program in place that directs sources to "complete a 'Form of Emission Reporting' and provide all necessary data within the time specified by the local Environmental Protection Bureau (EPB)."[249] Such a requirement must be extended to the SAR source facilities. It has been observed, however, that the SO_2 emission data reported by sources was calculated based on coal consumption

246. SUSAN WILEY HARDWICK & DONALD G. HOLTGRIEVE, PATTERNS ON OUR PLANET: CONCEPTS AND THEMES IN GEOGRAPHY 102-09 (1990). Due to the low angle of the sun, cold air builds up at the poles creating high-pressure areas. *Id.* This forces a southerly outflow of air towards the equator, deflected eastward by a phenomenon known as the Coriolis effect. *Id.*

247. The tropics are limited to a maximum latitude of 23°26'22" N in the Northern Hemisphere by the Tropic of Cancer and 23°26'22" S in the Southern Hemisphere by the Tropic of Capricorn. Hong Kong is located at 15° N, Macau at 22°10'00" N, and Guangzhou, the capital city of Guangdong Province, at 23°06'32" N, placing all within the tropical region. CENT. INTELLIGENCE AGENCY, CIA WORLD FACTBOOK 291, 394 (2009).

248. Stanford's Michael Wara and his colleague David Victor recently investigated a group of offsets offered under the Kyoto CDM and determined that contributions to many projects in China are used to acquire the offsets, though no impact was made on their production schedules. *See* Barone, *supra* note 209, at 72, 74.

249. Jintian Yang & Jeremy Schreifels, Organisation for Economic Co-operation and Development [OECD], *Implementing SO_2 Emissions in China*, at 11, CCNM/GF/SD/ENV(2003)16/FINAL, (Mar. 17-18, 2003), *available at* http://www.oecd.org/dataoecd/11/23/2957744.pdf.

and the sulfur content of the coal.[250] This is insufficient for ETS because it assumes stable operating conditions over a long time period, not on a realistic or continuous basis. While others have concluded that the size of China's power sector makes it "neither feasible nor necessary to require all sources to install" continuous monitoring equipment, the authors of this paper disagree.[251] Quarterly reporting has been criticized in the EU, while continuous IT-based monitoring forms the backbone of successful programs in the U.S. and Finland.[252] The administrative burdens doubtlessly seemed overwhelming in those contexts as well, but proved worthwhile in ensuring long-term compliance. According to the MEP, most power plants are already reporting data on the internet.[253]

The closed domestic setting would permit domestic administrative and civil law authorities to enforce compliance in a rule of law state. The U.S. ARP succeeds because it has centralized enforcement authority. Chapter 3 of the APPCL states that if emissions from regulated sources exceed the prescribed discharge standards or total quantity, measures including the installation of desulphurization and dust-removing equipment must be taken.[254] It mandates that delinquent enterprises operating within specially designated acid rain or SO_2 control zones be forced to meet the emission discharge standards within a set time period or fines will be imposed by the local environmental protection bureau.[255] As has been repeated throughout this article, extending these essential measures to include the SARs is the challenge. While mainland China would not require a special transboundary regime, incorporating the SARs into a regional or national scheme will constitutionally require a transboundary consultation and dispute resolution forum, as Beijing can not legislate environmental standards to the SARs. No such discussion has yet occurred between Beijing and the SAR Governments.

In sum, some institutional prerequisites exist in China, though some are lacking. Though implementation will be challenging for practitioners to achieve, it is possible that China may develop a

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250. *Id.*

251. *Id.*

252. *See supra* Part IV.C.

253. It was reported early this year that more than 3,000 power plants, about 80% of all Chinese power plants using fossil fuel, have installed computerized monitoring system and have been connected to the monitoring system of local environmental protection departments. Wang Shiling, *Paiwuquan Jiaoyi Dianli Xianxing* [Emissions Trading Starts with Power Plants], JRJ.COM, Jan. 8, 2009, http://finance.jrj.com.cn/2009/01/0800003263607.shtml (last visited Apr. 18, 2010) (translated by author).

254. *See* Zhonghua Renmin Gongheguo Daqi Wuran Fangzhi Fa [Air Pollution Prevention and Control Law, art. 30.

255. *Id.* arts. 30, 48.

system that works with some of its own characteristics. The inclusion of the SARs may, if carefully orchestrated, increase chances of success.

B. Current Status of Regulatory Framework for a Pearl River Delta ETS

Incorporating the HKSAR will strengthen any Chinese enterprise because Hong Kong is a rule of law territory. Its participants will take the ETS scheme seriously and demand that its counterparts do the same. Indeed, China began its modern practice of statutory interpretation due to the necessity to interpret the Basic Law for the HKSAR.[256] Guangdong is a rich industrial province with relatively high standards of living and bureaucratic efficiency. Furthermore, the Central Government would like to see a successful transboundary regime prosper in order to bolster its efforts to lure Taiwan into closer integration with the Mainland. However, an ETS program is difficult to implement in the "one country, two systems" context as Beijing is barred from legislating in purely domestic areas reserved to the SARs, including environmental policy. Practically speaking, however, Hong Kong has only two relatively modern power plants and sits downwind of its heavily industrialized neighbor to the north, Guangdong Province.[257] Thus, Hong Kong would likely benefit from any ETS, national or regional, that encompasses Guangdong.

Unfortunately, the proposed PRD ETS also has insufficient legal foundation on which to stand, but for different reasons. Perhaps because of its excellent rule of law institutions, the HKSAR has always been cautious about passing environmental legislation. The first major legislation on air pollution control in Hong Kong was the 1959 Clean Air Ordinance, replaced by the Air Pollution Control Ordinance (APCO) in 1983.[258] To its credit, the APCO in-

256. The first formal interpretation of a piece of national law by the NPCSC was done on June 26, 1999, examining Articles 22 and 24 of the Basic Law of the HKSAR. Since then, the NPCSC has issued dozens of interpretations of other national laws, especially criminal. Lin Feng, *The Constitutional Crisis in Hong Kong - Is it over?*, 9 PAC. RIM LAW & POL'Y J. 281, 281-82 (2000).

257. Hong Kong's two power companies are the Hong Kong Electric Company Limited (HEC) and China Light & Power Co. Hong Kong Limited (CLP). Compared to the more primitive units in Guangdong Province, both are already relatively clean burning and little more can reasonably be done to limit their emissions, which have declined by 55% between 1992 and 2006. Leung et al., *supra* note 46, at 96.

258. Air Pollution Control Ordinance, (1983) Cap. 311 (H.K.). *See* Environmental Protection Department, A Concise Guide to Air Pollution Control Ordinance, http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/guide_apco.html (last visited Apr. 18, 2010).

cludes a comprehensive air pollution control strategy with planning, monitoring, and legislative enforcement provisions.[259] Part II of the APCO concerns planning and contains two essential elements. The first is the declaration of air control zones, of which the HKSAR Government has designated ten.[260] The second is the establishment of air quality objectives in respect of these zones.[261] In 1987, Air Quality Objectives (AQOs) for seven widespread air pollutants were established.[262] What should be noted is that these AQOs are the only objectives which the HKSAR Government currently intends to achieve. The HKSAR's first Chief Executive, Tong Chee Hwa, stated in his 2003 policy address that a goal would be "to reduce by 2010 the emission of four major air pollutants in the region by such levels as will enable Hong Kong to achieve the current air quality objectives."[263] However, that aspiration never yielded a statutory requirement, and it was never certain that Hong Kong could achieve its fanciful 2010 goal because no mechanisms to ensure attainment exist.[264] Though the APCO includes an obligation for the authorities to achieve the air quality objectives (AQOs) "as soon as reasonably practicable,"[265] it is

259. Edward J. Epstein, Comment, *Air Pollution Control in Hong Kong: Back to Square One?*, 13 H.K. .L.J. 365, 366 (1983).

260. Air Pollution Control Ordinance, (1997) Cap. 311E (H.K.).

261. Air Pollution Control Ordinance, (1997) Cap. 311 § 7 (H.K.).

262. The seven air pollutants are sulfur dioxide, total suspended particulates, respirable suspended particulates, nitrogen dioxide, carbon monoxide, photochemical oxidants, and lead. The HKSAR Government is currently considering an amendment of the AQOs to make them consistent with WHO requirements. HKSAR Environmental Protection Department, API and Air Monitoring Background Information, Air Quality Objectives, http://www.epd-asg.gov.hk/textonly/english/backgd/hkaqo.php (last visited Apr. 18, 2010). Furthermore, the "AQOs may be reviewed from time to time to include a wider range of air pollutants and, if necessary, to tighten the standards taking into account international developments for better protection of the health and well being of the community." *Id.* However, "the Hong Kong SAR and mainland air quality objectives (AQO) are long outdated and provide no health protection from pollution." Hedley et al., *supra* note 3, at 552. In 2007, the HKSAR Government began considering amending the AQOs to make them consistent with WHO requirements released in 2006. HKSAR Environmental Protection Department, A Study to Review Hong Kong's Air Quality Objectives, http://www.epd.gov.hk/epd/english/environmentinhk/air/air_quality_objectives/review_aqo.html (last visited Apr. 18, 2010); *see also* HKSAR ENVTL PROT. DEP'T, AGREEMENT NO. CE 57/2006 (EP) REVIEW OF THE AIR QUALITY OBJECTIVES AND DEVELOPMENT OF A LONG TERM AIR QUALITY STRATEGY FOR HONG KONG – FEASIBILITY STUDY, *available at* http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/files/ea_panel_paper_annex0707e.pdf; WHO, *supra* note 9.

263. Tong Chee Hwa, Chief Executive, Policy Address: Environmentally Responsible Development (Jan. 13, 2003), *available at* http://www.policyaddress.gov.hk/pa03/eng/agenda5.htm.

264. *See* Air Quality Regulations, 1997, S.I. 1997/3043, explanatory n. (H.K.). In contrast, statutory deadlines have been set in similar legislation in the UK for the Government to achieve various AQOs. The Air Quality (England) Regulations, 2000, S.I. 2000/928, tbl. 1.

265. Environmental Protection Department, Air Quality Objectives, http://www.epd-asg.gov.hk/english/backgd/hkaqo.php (last visited Apr. 18, 2010).

doubtful that this obligation can be fulfilled, given that little power has been provided to the EPD Director to do so.[266]

The HKSAR did begin imposing emission caps on SO_2 in 2005 through licenses issued by the Government to the power plants.[267] Its second Chief Executive, Donald Tsang, pledged in his 2006 policy address that those emission caps would be progressively tightened to meet the 2010 targets and that the Government would not allow the targets to be compromised in any way.[268] Furthermore, in 2008, several provisions were added to the APCO to permit the HKSAR Government to set overall emissions caps,[269] but this measure will only be applied from January 1, 2010 onwards.[270] According to the amended APCO, the 2010 emission cap for existing power plants has been set at 25,120 tons of SO_2, a 54% reduction compared to 1997 baseline levels.[271] The criterion for allocation of emission allowances to power plants will also be different. At present, caps are set based upon the expected emissions from various power plants and differ widely according to fuel used.[272] Starting in 2010, emission allowances for SO_2 will be allocated on a pro-rata basis in accordance with a source's respective share of the total amount of electricity generated for local consumption.[273] Since emission allowances will be allocated to each power plant instead of each power company, trading may take place between local power plants, even if they belong to the same parent company. The amended APCO has incorporated a mechanism for allowing any

266. *See* Epstein, *supra* note 259, at 367.

267. For example, in its renewed license at the end of 2007, an emission cap of 520 tons was imposed for the years of 2008 and 2009 on Black Point Power Station. Press Release, Envtl. Prot. Dep't, Black Point Power Station Licence Renewed (Dec. 31, 2007), *available at* http://www.epd.gov.hk/epd/english/news_events/press/press_071231a.html; *see also* Legislative Council Panel on Environmental Affairs, A Proposal to Amend the Air Pollution Control Ordinance (Chapter 311), (proposed Dec. 17, 2007), *available at* http://www.epd.gov.hk/epd/english/news_events/legco/files/EAPanel_20071217_eng.pdf.

268. Donald Tsang, Chief Executive, H.K. Special Admin. Region, Proactive, Pragmatic, and Always People First: 2006-07 Policy Address ¶ 53 (Oct. 11, 2006), *available at* http://www.policyaddress.gov.hk/06-07/eng/pdf/speech.pdf.

269. Air Pollution Control Ordinance, (1997) Cap. 311 § 15 (H.K.).

270. *Id.* § 15(4)(b).

271. Envtl. Prot. Dep't, Technical Memorandum to Stipulate the Quantities of Emission Allowances for Power Plants, EP CR 9/150/21, ¶ 5 (November 2008), *available at* http://www.legco.gov.hk/yr08-09/english/subleg/brief/ss_no5-e.pdf.

272. "For example, in 2007, the natural gas-fired Black Point Power Station was allowed to emit only 520 tonnes of SO_2, while the predominantly coal-fired Lamma Island station was allowed to emit 29,500 tonnes." Christopher Tung, *Air at the End of the Tunnel, Part II*, Mar. 3, 2008, http://www.mallesons.com/publications/2008/Feb/9326049W.htm (last visited Apr. 18, 2010). The Castle Peak Power Station was allowed to emit 41,400 tons in 2008 and 39,400 tons in 2009, Press Release, Envtl. Prot. Dep't, Castle Peak Power Station's Licence Renewed with Tightened Emission Caps (July 18, 2007), *available at* http://www.epd.gov.hk/epd/english/news_events/press/press_070718a.html (last visited Apr. 18, 2010).

273. Legislative Council Panel on Environmental Affairs, *supra* note 267, ¶10.

regional power plant to purchase emission allowances from another power plant in the PRD region under the Pilot Scheme.[274] Under the proposed rules, each allowance purchased by a power plant in Hong Kong under the scheme will increase the purchaser's allocated allowance on a one-to-one basis, which will be subject to the approval of the EPD Director.[275] This arrangement is quite similar to the ETS adopted by the European Union for greenhouse gases.

Such innovations are necessary. An EPD study conducted in 2002 suggests that Hong Kong's first fifteen years of attempted AQO compliance failed and that various pollutants emitted by the energy sector are projected to increase in the future.[276] Unfortunately, despite the urgency of the situation, the proposed regime is being discussed in terms of regulating power plants on a voluntary basis. Whereas HKSAR sources are susceptible to political and consumer activism, it is highly unlikely that any source in Guangdong will willingly submit to a scheme that increases operating costs.[277] Guangdong is part of a developing country dependent upon on heavy industry, with relatively fledgling grassroots environmental activism. Even assuming that Hong Kong's two power companies subscribe, only twelve of Guangdong's plentiful source facilities are eligible for regulation under the currently proposed subscription criteria.[278] Without considerable incentives for them to join (or disincentives not to), it is highly unlikely that even those sources will subscribe. Furthermore, implicit in the ability to subscribe at will is the ability to withdraw at will. As the failure of the EU ETS demonstrates, caps must be narrowly tailored to exact

274. *Id.* ¶¶ 15, 16.

275. *Id.*

276. CH2M HILL (CHINA) LTD., *supra* note 46, ch. 7. For example, the chapter summary on page 72 states succinctly, "[a] Regional air quality problem exists and air quality is deteriorating. The currently committed air pollution control measures in the Region are not adequate to curb the growth of emissions." Again, not all of the increase is Hong Kong's fault, as its environment suffers from the rapid industrialization of upwind Guangdong Province. *Id.* ¶ 1.1.3; *see supra* Part IV.B and note 188. Thus the HKSAR Government should be eager for the implementation of more effective and sophisticated abatement measures, including emissions trading. Target pollutants include VOC_s, RSP_s, NO_x, and SO_2. Leung et al., *supra* note 46, at 94.

277. Although there are numerous examples of voluntary ETS regimes—namely the Regional Greenhouse Gas Initiative, Chicago Climate Exchange, and Western Climate Initiative in the United States and the UK ETS in the United Kingdom—these were undertaken in the context of carbon dioxide emissions, in highly developed countries, with service economies and established environmental movements.

278. The current subscription encompasses power plants with at least one generator producing more than 100 MW. HKSAR Environmental Protection Department & Guangdong Provincial Government, *Zhujiang Sanjiaozhou Huoli Fadianchang Paiwu Jiaoyi Shiyan Jihua Shishi Fangan* [Implementation Proposal for the Trial Plan of Emissions Trading between Fossil Fuel-Fired Power Plants in the PRD Region] at app. I ¶ 2, *available at* http://www.epd.gov.hk/epd/tc_chi/news_events/legco/files/EAP_Emissions_Trading_070226_Annex_TC.pdf (translated by author).

system specifications. If a single source were to withdraw suddenly, allowance prices may collapse.

Also, a voluntary system will not help Guangdong achieve its environmental goals under the national and local reduction plans. Guangdong's SO_2 emissions totaled 1.29 million tons in 2005,[279] an increase of 70% from 2000.[280] Although they dropped slightly to 1.26 million tons in 2006,[281] provincial emissions should have been limited to 693,000 tons by 2005 under the national guidelines.[282] According to Guangdong's Eleventh Five-Year Plan for environmental protection, promulgated in 2007, SO_2 emissions should be capped at 1,100,000 tons by 2010.[283] This suggests that Guangdong is no longer as ambitious as it once was for environmental protection. The relaxed and non-binding caps mean that it is highly unlikely that the downwind HKSAR will be able to achieve its AQOs either.

It is also worth noting that the Macau SAR has been excluded inexplicably from the proposed PRD ETS. With a total capacity of 472 MW, Macau's only power supplier, the Companhia de Electricidade de Macau (CEM), would easily qualify it for regulation under the U.S. ARP scheme, which encompassed 100 MW facilities in Phase I and 25 MW in Phase II.[284] Interestingly, 68% of Macau's 2008 gross energy demand was imported, largely from Guangdong.[285] CEM must continue to expand its Macau operations or in-

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279. Yan Liang, *Guangdong Ends Ten-Year Increase of Sulfur Dioxide Emissions*, XINHUA, Jan. 8, 2007, http://english.gov.cn/2007-01/08/content_490178.htm (last visited Apr. 18, 2010).

280. WANG JINNAN ET AL., CHINESE ACAD. FOR ENVTL. PLANNING, PROPOSED SCENARIOS FOR TOTAL EMISSIONS CONTROL OF SO_2 EMISSIONS DURING THE TENTH FIVE-YEAR PLAN PERIOD IN CHINA 3 tbl.1, *available at* http://www.caep.org.cn/english/paper/Proposed-Scenarios-for-Total-SO2-Emissions-Control-in-2001-2005.pdf (SEPA statistics indicating that Guangdong Province's total SO_2 emissions in 2000 totaled 904,700 tons).

281. Yan, *supra* note 279.

282. WANG ET AL., *supra* note 280, at 9 tbl.3.

283. Office of Guangdong Provincial People's Government, *Guangdongsheng Huanjin Baohu yu Shengtai Jianshe Shiyiwu Guihua* [Eleventh Five-year Plan for Environmental Protection and Ecological Preservation in Guangdong Province], *available at* http://search.gd.gov.cn/detail?record=182&channelid=8907 (translated by author).

284. Companhia de Electricidade de Macau (CEM), Facilities Generation, http://www.cem-macau.com/-Facilities-Technology (last visited Apr. 18, 2010); *see* 42 U.S.C. §§ 4651d(b)-(f), (h), (j); Acid Rain Program, *supra* note 155; *supra* notes 156-58.

285. "In 2008, the gross energy demand was 3475 GWh of which 1103 GWh was produced by CEM and 2372 GWh has acquired from external suppliers. The energy breakdowns between CEM production and energy acquisition were respectively 32% and 68%." CEM, *supra* note 284. "[A]s Macao has become more dependent from importation and today nearly 70% of the power supply is imported." Press Release, CEM, Guangdong Power Grid to Raise Electricity Price by About 10% Starting from July 2008 (Dec. 23, 2008), http://www.cem-macau.com/Guangdong-Power-Grid-to-raise?var_recherche=guangdong (last visited Apr. 18, 2010). For more details on the power infrastructure encompassing Zhuhai, Guangdong Province and Macau, see CEM, CEM Held Ground Breaking Ceremony for the Third Interconnection Between Macau and Zhuhai, http://www.cem-

crease imports, as projections show an annual energy consumption growth rate estimated at 11%.[286] Thus, Macau's inclusion in a regional ETS is necessary: its one domestic power company produces four-times more energy than a U.S. ARP Phase I source and could ramp up production.

The previous discussion demonstrated several market maintenance problems in foreign contexts that could reoccur locally if a Pearl River Delta ETS is established. Among them, the market may be slow to develop, and allowance prices are more likely to collapse if the market is not centrally administered. New ETS regimes should not suffer from these same initial obstacles. ETS is no longer novel and is proven in reducing SO_2 emissions. Participants should feel no hesitation entering such a market, especially with the reduced transaction costs provided by the internet. Indeed, a well-planned ETS market may develop especially quickly in Hong Kong given the local expertise in securities trading. However, those experts would insist that the market must maintain stability while in operation. The total of the U.S. ARP caps were stipulated in advance of the entire program, allowing participants to plan accordingly for the entire length of the program, whereas the EU ETS member states and Jiangsu authorities were allowed to disrupt market practice midstream.[287] Planning must be centralized and long-term for the length of the program. While government has had a proactive role in facilitating deals in Jiangsu Province, an internet-based market would eliminate the need for such interventions while lowering public costs, increasing transaction speed, and eliminating the possibility of corruption. Implementation will also be aided if the authorities stipulate to their utilities in advance regarding how to include the cost of the program in the ratemaking process.

Furthermore, a CDM-like program based on the Kyoto model may prove especially useful if adapted to the local (or national) context. Given regional wind patterns and the overriding need to clean up the more primitively designed upwind sources in Guangdong Province, the HKSAR should seek the inclusion of such a mechanism. In 2003, the HKSAR's Advisory Council on the Environment concluded that the costs for further emissions reductions at the two local utilities would be very high and have a signif-

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macau.com/CEM-held-Ground-Breaking-Ceremony?var_recherche=guangdong (last visited Apr. 18, 2010) and CEM, Transmission and Distribution, http://www.cem-macau.com/Transmission-Distribution?var_recherche=guangdong (last visited Apr. 12, 2010).

286. CEM, *supra* note 284.

287. *See supra* Part IV.B.

icant impact on electricity tariffs for consumers.[288] On the other hand, most of the power plants in Guangdong are still relatively primitive in design, so reducing emissions from these plants through replacements or upgrading would be much cheaper.[289]

Monitoring and enforcement authorities also provides a unique challenge in the transboundary context; though progress is being made. At the second Hong Kong-Guangdong Cooperation Joint Conference held in September 1998, the Governments reached a consensus to enhance transboundary cooperation on environmental protection issues.[290] They also agreed to conduct a joint study on regional air quality with the intent to halt further deterioration.[291] That study, published in 2002, indicated that the air pollution problem in the PRD region is similar to that faced by other ecosystems worldwide, caused mainly by NOx, ozone, and respirable suspended particulates (RSPs).[292] The study anticipated that, by 2010, the regional economy, population, electricity consumption and vehicle mileage in the PRD region will grow by 150%, 20%, 130%, and 190% respectively.[293] In fact, these predictions proved extremely conservative.[294] With these growth trends, it is obvious that regional pollution emissions will continue to increase if the two Governments only rely upon existing abatement measures.[295]

Against that background, at the third meeting of the Hong Kong-Guangdong Cooperation Joint Conference in April 2002, the two Governments issued a Joint Statement on Improving Air Quality in the Pearl River Delta Region.[296] Through the Joint Statement, the Governments "have agreed to reduce by 2010, on a

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288. *See* Press Release, Hong Kong Government Information Centre, Progress of Emissions Trading Pilot Scheme (Dec. 10, 2003), *available at* http://www.info.gov.hk/gia/general/200312/10/1210253.htm. Given projected population and economic growth it will be difficult to locally reduce emissions further from their present level. Press Release, Hong Kong Government Information Centre, HK Spares No Efforts to Reduce GHG Emission (Oct. 29, 2003), *available at* http://www.info.gov.hk/gia/general/200310/29/1029203.htm.

289. *See* Leung et al., *supra* note 46, at 96.

290. Press Release, Hong Kong Government Information Centre, Joint Statement on Improving Air Quality in the Pearl River Delta Region (Apr. 29, 2002), *available at* http://www.info.gov.hk/gia/general/200204/29/0429128.htm.

291. *Id.*

292. *Id.*

293. *Id.*

294. Findings of the Report on the Mid-term Review of the Pearl River Delta Regional Air Quality Management Plan indicate that, in 2010, the economy, population, electricity consumption and vehicle mileage in the area will increase by 509%, 56%, 158% and 319% respectively, compared to the 1997 levels, which far exceed the assumptions made in 2002. ENVTL. PROT. DEP'T., REPORT ON THE MID-TERM REVIEW OF THE PEARL RIVER DELTA REGIONAL AIR QUALITY MANAGEMENT PLAN Annex E ¶ 8 (2008), *available at* http://www.epd.gov.hk/epd/english/news_events/legco/files/Eng-AnnexE-210108.pdf.

295. Press Release, Hong Kong Government Information Centre, *supra* note 290, para. 4.

296. *Id.*

best endeavor basis, regional emissions of sulphur dioxide, nitrogen oxides, respirable suspended particulates and volatile organic compounds by 40%, 20%, 55%, and 55% respectively, using 1997 as the base year."[297] The aim is noble. Achieving these targets will enable the HKSAR to meet its current AQOs, and most cities in the PRD region will be able to meet their relevant national air quality objectives.[298] The Governments subsequently designed a Regional Air Quality Management Plan.[299] A mechanized Regional Air Quality Monitoring Network was already in full operation across Hong Kong and Guangdong.[300] This record of cooperation indicates that Hong Kong and Guangdong are enthusiastic about forming an ETS, but an agreement must be reached enabling all three jurisdictions—Guangdong, Hong Kong and Macau—to subscribe to an enforceable regime.

Unfortunately, the political will is lacking. The present plans and mechanisms are non-binding, and the implementation of an enforceable transboundary pollution regime is not making progress. The most fruitful attempt at implementing a regional air quality regime was a 2005 Agreement reached between nine provinces in South China and the two SARs.[301] The Agreement contains seven articles. Article 2 sets out four principles for cooperation, one of which reiterates participation is on a strictly voluntary basis.[302] While Article 3 calls for reductions in the quantity of emitted air pollutants,[303] the Agreement does not contain any details on how to reduce emissions. The lack of these details means that, at present, a plan cannot be implemented and the voluntary nature of the scheme will ultimately frustrate its purpose. It is thus fair to say the Agreement merely offers a framework. Bringing that framework to life will require much more concentrated action,

297. *Id.* para. 6.

298. *Id.*

299. LEGISLATIVE COUNCIL PANEL ON ENVIRONMENTAL AFFAIRS, LC PAPER NO. CB(1)547/08-09(01) BACKGROUND BRIEF ON THE PEARL RIVER DELTA REGIONAL AIR QUALITY MANAGEMENT PLAN (2009), *available at* http://www.legco.gov.hk/yr08-09/english/panels/ea/ea_iaq/papers/ea_iaq0113cb1-547-1-e.pdf; Press Release, HKSAR Envtl. Prot. Dep't, Pearl River Delta Regional Air Quality Management Plan Mid-term Review Report Announced Today (Jan. 8, 2008), http://www.epd.gov.hk/epd/english/news_events/press/press_080108a.html (last visited Apr. 18, 2010).

300. The Network has been in operation since 2005. HKSAR Government, Pearl River Delta Air Quality: Regional Air Quality Monitoring Network, http://www.gov.hk/en/residents/environment/air/raqi.htm (last visited Apr. 18, 2010).

301. The nine provinces are Fujian, Jiangxi, Hunan, Guangdong, Guangxi, Hainan, Sichuan, Guizhou and Yunnan. Guangdong Environmental Protection Bureau, Fan Zhu Sanjiao Guyu Huanjing Baohu Hezuo Xieyi [Pan-Pearl River Delta Regional Environmental Cooperation Agreement], Jan. 25, 2005, *available at* http://www.pprd.org.cn/huanbao/200504/t20050415_1340.htm (translated by author).

302. *Id.*

303. *Id.*

such as a legitimate ETS regime with the necessary centralized forums for long-term success. These will need to be established in either the regional or nationwide context if the HKSAR and Macau SAR are to be included in a meaningful way.

C. A Supranational Environmental Forum Encompassing Mainland China and Its Special Administrative Regions is Both Necessary and Attainable

As has been stressed repeatedly, there are overwhelming institutional advantages to having a unified and centralized authority overseeing an ETS program. While such a program has not yet been implemented on a nationwide basis in China, the requisite authority for such an institution certainly exists. The tricky part in the Chinese context is including the Special Administrative Regions. Under the "one country, two systems" framework, the SARs maintain their own separate constitutional dignities in the field of environmental law. The Governments of those SARs must be persuaded through domestic pressure as well as their desire for environmental self-preservation and regional integration to subscribe to a national program. While they could conceivably enjoy the benefits of a Mainland ETS as free-riders, it is just as likely that undesirable windborne pollution redistributions may exacerbate regional deposition. It would thus be in the interests of all parties to have an ongoing voice in the design and maintenance of the program. This will require an executive agreement or other binding subscription arrangement to establish an appropriate supranational mechanism.

Bilateral executive agreements between the HKSAR and Beijing have proven to be a viable option for creating intimate partnerships between the two Governments, as demonstrated by the cooperation under Article 95 and the Closer Economic Partnership Agreement.[304] This becomes an intriguing option in the context of transboundary pollution, especially as the need for uniform compliance and enforcement becomes clear. A trilateral arrangement could enable ongoing environmental cooperation between mainland China, Hong Kong, and Macau. On that foundation, a supranational institution with a complete delegation of regulatory powers can be established. Indeed, such a transboundary body must be created to harmonize and oversee the cap-fixing, market stabilizing, monitoring, and enforcement functions in the three PRD jurisdictions. Program conditions could be enforced directly, and

304. *See supra* notes 87-89 and accompanying text.

multi-party, binding arbitration procedures could be invoked in the event of irreconcilable or unforeseen legal differences or enforcement issues between the systems. Anything less is likely to result in well-publicized and oft-criticized failure.

Establishment should not be a major political obstacle in the context of mainland China and the SARs, where a strong relationship between the goals of ultimate regional integration and an institutional apparatus for environmental protection is desirable. An unwillingness by the parties to trust a transboundary apparatus with the exercise of regulatory duties, even in a tightly delegated and supervised form, would speak poorly of efforts for long-term integration and cooperation. Indeed, the development of a supranational environmental body between mainland China and its two SARs would serve as a portal through which cooperative efforts can be undertaken directly between representatives of the three systems. If the three diverse legal systems can agree to cooperate on an ongoing basis and be made to co-exist and prosper within a successful environmental framework, the resulting intercourse would provide a model of international cooperation heard around the world. It would not matter whether the initial effort is made at the regional or national level. Although the authors firmly believe the time has come for China to implement a national ETS program, a regional bloc consisting of Guangdong Province and the SARs would provide the same conceptual model while placing additional pressure on Beijing to institute a national program.

While a Hong Kong-Guangdong Cooperation Joint Conference exists, it is merely consultative in nature. Currently, there is nothing in the construction of this institution that suggests any move toward the development of an autonomous regulatory power. Thus, the PRD ETS will likely prove to be more of an EU ETS styled joint venture than an integrative body. Unfortunately, history proves that this arrangement will likely be insufficient to achieve the agreed upon goals. We suggest that this body be bolstered with independent and meaningful regulatory authority necessary to oversee the regional program. If successful, it will provide a model for more concerted action between the SARs and mainland China in the future.[305]

305. For a more detailed example of how such an institution may function, please see our paper offering suggestions to empower the International Joint Commission, a bilateral environmental forum operating between the United States and Canada, to serve a similar role as in the proposed U.S.-Canada transboundary ETS. *See* Lin & Buhi, *supra* note 38.

CONCLUSION

This article reiterates the overwhelming needed for an ETS system to be installed in China to improve human and ecosystem health. Though still in the initial planning stages in mainland China, the Governments of the Hong Kong Special Administrative Region (HKSAR) and the People's Government of Guangdong Province (Guangdong) are moving ahead with a separate ETS agreement. However, the constitutional context of "one country, two systems" will frustrate a meaningful partnership unless authority is delegated to a transboundary, supranational institution. The Governments have an opportunity to find a solution on a limited basis by experimenting with such a mechanism on the regional level. However, that regime, as presently conceptualized, is hardly developed and suffers from several fatal flaws. The environmental objectives to be achieved are unclear, the Macau SAR has been inexplicably exempted, no mechanisms presently exist to settle a dispute arising between these governmental entities; and there is no centralized planning, coordination, or enforcement authority between the jurisdictions. International experience in emissions trading proves that these are the basic necessities of a successful ETS program. While a Hong Kong-Guangdong Cooperation Joint Conference composed of representatives of both Governments exists, it is merely consultative in nature and lacks authority to oversee the breadth of a viable ETS program.

A centralized delegation of regulatory powers is paramount for an effective ETS regime to function, as proven by the successful exercise of the U.S. ARP and shortcomings of the early EU ETS. Given China's unique constitutional structure, a supranational panel must be authorized to harmonize and oversee the cap-fixing, market maintenance, compliance monitoring, and enforcement functions across all jurisdictions. This is true in the case of either a national or regional ETS. Any non-binding substitute will result in well-publicized and oft-criticized failure. Practice indicates that executive agreements between the SARs and mainland China are feasible options for addressing bilateral issues. However, establishment of a permanent transboundary forum would ensure flexibility and ongoing cooperation among the three jurisdictions as implementation proceeds. Indeed, such an environmental panel would help to further integrate the three legal systems by serving as a portal through which ongoing implementation efforts can be directly undertaken. Program conditions could be enforced directly, and multi-party arbitration could be used in the event of irreconcilable or unforeseen legal differences between the systems. If all

three could be made to co-exist and prosper within a successful public law framework, the resulting intercourse would provide a model of international environmental cooperation to the world.

At the end of the day, conception can only take a supranational effort so far. The real value of a venture is the ability of the institution or mechanism, at its core, to achieve the stated results. At present, the abilities of the proposed PRD and national ETS to deliver results are suspect. More favorable laws currently exist for a national ETS in China, but they presently lack teeth given that enforcement requires political will and engagement by all institutions. A stronger rule of law society exists in the SARs, but they are slow to adopt environmental legislation because of the requisite of enforcement. In any event, a supranational forum is vital for meaningful inclusion of the SARs in a viable program. The authors implore the Governments of all respective parties to prioritize the development of such a forum and a corresponding ETS regime with all possible speed.