Institutional and legal issues of emissions trading

Richard B. Stewart, New York University School of Law
Philippe Sands, University of London and New York University School of Law

Abstract
Emissions trading systems as a means of air pollution control have been developed in recent years to address some important limitations of traditional command and control environmental regulation. Trading systems address many of the inefficiencies of command systems and may promote cost-effectiveness by introducing flexibility and providing incentives for sources with lower control costs to undertake more of the control burden. In the United States, for example, experience demonstrates that emissions trading systems for diffuse air pollutants can work effectively to protect the environment, provide desirable flexibility in the means of control, stimulate environment-friendly innovation and achieve very significant cost savings if such systems are properly designed and enforced. Successful U.S. programs have included trading systems to eliminate lead in gasoline, reduce sulfur dioxide emissions by 50%, reduce smog in Los Angeles, phase out chemicals that deplete stratospheric ozone, and provide flexibility in air pollution regulation generally.

Emissions trading systems are especially well suited to addressing climate change because they achieve limitations of net greenhouse gas emissions at far less cost and stimulate innovation along environmentally friendly paths to sustainable development. Because greenhouse gas emissions mix globally, net reductions of greenhouse gas emissions provide the same environmental benefit regardless of where on the globe they occur. The flexibility afforded by trading systems thus allows emissions reduction and sequestration activities to occur wherever greenhouse gas limitations can be accomplished at least cost. In recognition of these advantages, the Kyoto Protocol authorizes emissions trading among Annex I countries, as well as between Annex I countries and developing countries through the Clean Development Mechanism (CDM). Reducing the costs of achieving limitations may promote the likelihood of successful international agreement on and implementation of more ambitious limitations measures. Equally important, the CDM can provide important economic and environmental benefits for developing countries by channeling additional public and private sector investment capital from the developed countries into sustainable development in developing countries.

This paper starts with an explanation of the basic features of emissions trading systems. It then reviews the successful domestic use of trading systems in the United States. Finally, it discusses the international use of emissions trading to mitigate climate change, including Annex I trading and trading under the CDM.
Introduction

The Kyoto Protocol to the United Nations Framework Convention of Climate Change (UNFCC) authorizes a variety of greenhouse gas (GHG) emissions trading systems in order to combat global warming in an efficient, cost-effective manner. Article 17 of the Protocol authorizes emissions trading among Annex I countries in order to fulfill their Protocol emissions limitation obligations. Article 12 authorizes a different type of trading system, involving developing as well as developed countries, by defining a Clean Development Mechanism (CDM) administered by an Executive Board established by and accountable to the parties to the UNFCC and Protocol. Under the CDM, Annex I countries that invest in emissions limitations and sink enhancement projects in developing countries obtain certified emission reduction credits (CERs) that count against their emissions limitation obligations. CERs would be traded internationally. The Protocol provides for the participation of private entities in the CDM. The objective of the CDM is to direct capital and technology to developing countries in order to promote energy efficient and other forms of environmentally friendly development and to enable the Annex I countries to meet a portion of their GHG limitations obligations in a cost-effective manner. The implementation of these and other Kyoto flexibility mechanisms is currently under active discussion and consideration by the Parties to the Convention and Protocol.

What are the basic features of emissions trading systems?

Emissions trading systems have been developed in recent years to address some important limitations of traditional command and control environmental regulation. Command regulations impose fixed quantitative limits on emissions by each pollution source. In order to make this task manageable, regulators typically establish uniform limitations for categories of sources, such as power plants and steel mills, based on widely available control technologies. In practice, however, the sources in a given category often vary substantially in both their function and the cost of their emissions control. The use in these circumstances of uniform “one-size fits all” requirements can lead to serious inefficiencies. Sources are often precluded from implementing alternative methods, such as source-specific process changes and pollution prevention measures, which may limit emissions far more inexpensively than generic control technologies. In addition, the current uniform requirements do not account for the varying cost among sources. As a result, sources with very high costs are more heavily burdened than sources with lower costs and societal resources are wasted. The total cost of achieving a given overall emissions limitation target may be two or three times higher under command regulation than under a more flexible system as a result of these inefficiencies.

Emissions trading systems can address many of the inefficiencies of command systems and may promote cost-effectiveness by introducing flexibility and providing incentives for sources with lower control costs to undertake more of the control burden. Under a tradable emissions quota system, a government authority issues a fixed number of pollution quotas. Each quota entitles the holder to emit a given amount, such as a ton, of a pollutant. A source may not emit pollution in excess of the number of quotas that it holds. Thus, the fixed stock of quotas effectively puts a cap on total pollution by all sources. Quotas are allocated to individual sources by auction or by administrative allocation. Quotas may be traded, bought, and sold, and held by anyone. Because quota supplies are limited, they will...
be worth money. Should a source’s emissions exceed its initial quota holding, it will have to purchase additional quotas. Should it simply use all of its allotted quota, the source foregoes the potential sale of the quota that would have become surplus if it had lowered its emissions. Thus a tradable quota system, like a pollution tax system, imposes a price on each unit of pollution emitted. Where quotas are traded in markets, this price is set by market supply.

Tradable quota systems are designed to allow individual sources flexibility in deciding what level of emissions limitation to strive for and how to achieve it. Sources are no longer locked into uniform “one size fits all” requirements. Quota systems also provide strong incentives for sources to reduce their emissions. Sources with lower control costs will control their pollution more, and sell or transfer their excess quotas to sources with higher control costs. As a result, the tradable quota system will facilitate cost-effective emissions limitations. The cost savings that result, compared to the command system, could be in the range of billions of dollars to control a given pollutant in a domestic setting such as the U.S., and trillions of dollars in the case of international GHG emissions limitations. Moreover, tradable quota systems provide long-term incentives for firms to develop more resource-efficient, less polluting methods of production that reduce emissions less expensively. Firms that succeed in this effort will save money, enjoy a competitive advantage, and profit financially from pollution control. Society will benefit because pollution will remain limited while economic development moves forward. By contrast, traditional command regulation allows sources to discharge pollutants within regulatory limits for free, and sources have no incentive to reduce such emissions.

Another emissions trading system relies on emission reduction credits. Under this system, a source that reduces pollution below the levels fixed by regulatory requirements or other emissions baselines obtains an emission credit. The source may then transfer or sell that credit to another source, which can use it to help meet its emissions limitation requirement. Like tradable quota systems, credit systems provide sources with flexibility and incentives to reduce emissions and reallocate control efforts from high-cost sources (who will purchase credits) to low-cost sources (who will generate credits and sell them) thereby producing a cost-effective allocation of control efforts. A credit system does not establish an initial set of quotas for all sources. Instead, credits are established on an individual basis for those sources that reduce their emissions below the levels required by regulations. As a result, tradable credit systems tend to have higher transaction and administrative costs than tradable quota systems.

Emissions trading systems are emphatically not a deregulatory form of laissez-faire. They are part of a regulatory framework establishing overall quantitative restrictions on emissions. Government plays a vital role by fixing the total amount of emissions allowed, establishing and enforcing the quota system, and prohibiting sources from emitting pollution in excess of the quotas or credits that they hold. Violations of these requirements, like violations of command requirements, are subject to administrative, civil, and criminal sanctions. Moreover, trading sys-
tems need not perpetuate existing pollution levels. As illustrated by the U.S. trading programs for lead in gasoline, sulfur dioxide emissions, and ozone-depleting substances, the number of quotas can be gradually reduced over time in order to reduce or even eliminate total emissions.

Emissions trading systems may not be well suited to deal with localized pollutants that will cause serious harm if too many sources are concentrated in a given location, or if their emissions are too high. In such cases, the flexibility provided by emissions trading systems may be a disadvantage, and limitations on trading or supplemental command regulation may be needed to ensure that localized pollutant concentrations are not excessive. Emissions trading systems are most suitable for widespread pollutants that are emitted by large numbers of sources.

What lessons can be learned from the U.S. experience with emissions trading systems?

Globally, the United States has the most extensive domestic experience with emissions trading systems. 3 Most of this experience has been in the context of air pollution control. Two programs have been regarded as especially successful:

• the phase-out of lead additives in gasoline during the 1980s; and
• the program adopted in 1990 to reduce sulfur emissions by 50% over a ten-year period.

These programs achieved substantial cost savings in meeting environmental objectives. These cost savings in turn promoted agreement on more ambitious environmental protection objectives than would have been possible under a traditional command system.

Lead reductions trading

When the U.S. Environmental Protection Agency (EPA) decided in 1982 to eliminate lead additives in gasoline, it opted to institute an emissions credit-trading program to accomplish the phase-out. Given the severity of the reduction (90% of the lead additive was to be removed by 1987), there was concern that some refinners, particularly smaller ones, would have difficulty complying. The credit-trading program added flexibility, which helped ease industry concerns about the feasibility of compliance. In addition, the EPA allowed “banking,” under which credits earned in one time period could be used in another, providing refiners with desirable flexibility in the timing of reductions. These flexibility features enabled the EPA to pursue further reductions than it would otherwise have been able to impose, which provided environmental as well as economic benefits. The EPA adopted regulatory requirements that progressively reduced the amount of lead allowed in gasoline on a fixed timetable. Refiners that reduced their gasoline lead content further and faster than required by the regulations earned credits that they could sell to other refiners that were facing higher costs and having greater difficulties meeting the schedule. Credits earned in one period could be “banked” for use in later periods. Vigorous trading occurred throughout the program’s history. An essential element of the program’s success was its low transaction costs. Credits were entirely fungible. They could be traded without review or approval by the EPA. The EPA monitored compliance and brought strong enforcement actions against cheaters. It is estimated that the trading program saved several hundred million dollars, compared to use of command regulations.

3 Experience with trading systems in other countries as well as the U.S. is reviewed in Richard B. Stewart, “Economic Incentives for Environmental Protection: Opportunities and Obstacles,” in Environmental Law, The Economy, and Sustainable Development: Europe, the United States, and the Global Regime (R. Revesz, P. Sands & R. Stewart, eds.) (2000).
SO₂ trading

Title IV of the U.S. Clean Air Act Amendments of 1990 instituted emissions and trading programs for sulfur dioxide (SO₂) emissions by fossil-fuel electric generating plants, which are the major source of acid rain. The program will reduce SO₂ emissions by 50% over a ten-year period. The way the program works is that the government issues allowances, each entitling the holder to emit one ton of SO₂, to existing plants based on their energy input. Allowances are issued annually and may be used in the year of issuance or banked for use in subsequent years. The number of allowances is being reduced over time on a fixed statutory schedule in order to achieve the targeted 50% reduction. Plants must install continuous emissions monitors. Plants whose emissions exceed the allowances that they hold pay a US$2000 penalty per ton and forfeit the corresponding number of tons the following year. Allowances are fully transferable. The EPA has successfully instituted an allowance tracking system to register trades and accounts on current allowance holdings.

A substantial market has developed in the allowances, including a Chicago Board of Trade futures market in the allowances that plants will receive in future years. Because many electric generating companies in the United States own a substantial number of plants, much trading has also been carried out internally among such plants rather than through open market sales. As of June 1997 nearly 2,700 transfers of allowances had occurred, involving 42.4 million allowances.

In addition to promoting a more cost-effective allocation of control burdens among plants, the flexibility afforded by trading has enabled plants to take advantage of a variety of emissions reduction methods including the use of low-sulfur coal and the dispatch of generation demands to low-emitting facilities. Customer energy conservation programs have also been implemented. These measures are often far less expensive than the uniform use of a single “end of pipe” flue gas desulphurization technology that would have been mandated under a command regulatory approach.

The SO₂ trading program is deservedly considered an enormous success. The program is ahead of schedule and running at far below the costs of a command system. As of 1996, emissions were more than 30% below the reduction schedule target. Control costs are less than 50% of the command regulatory alternative, resulting in more than US$5 billion in savings thus far; savings are projected to increase even more in the future. A strong monitoring and enforcement program has ensured 100% compliance by sources with quota limitations. Like the lead trading program, the SO₂ trading program has produced both environmental and economic benefits. The use of emissions trading to address acid rain broke a 13-year political stalemate over dealing with the problem and enabled agreement to be reached on the ambitious 50% reduction target.

Other U.S. emissions trading programs that have introduced beneficial flexibility in pollution control including the following:

**RECLAIM**

The RECLAIM program uses a quota trading system to reduce emissions of nitrogen oxides and sulfur dioxide in the heavily polluted Los Angeles Basin. The RECLAIM program was adopted with the support of regulators, environmental groups, and industry, all of which concluded that traditional command regulation had reached its limits in dealing with the pollution problems of Los Angeles.

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4. The futures market, along with the banking feature, creates significant inter-temporal flexibility. A plant that reduces its emissions faster than the schedule can bank its extra allowances for its own future use or sell the extra allowances to others for present or future use. A plant that plans to make its reduction investments later and accordingly has excess emissions in the near term can buy surplus allowances from others for the current year or can buy allowances for use in subsequent years through the futures market.
Under **reclaim**, allowances are issued to existing sources based on the amount that they are permitted to emit under current regulatory requirements. The allowances’ emissions value is reduced over time. There have been a substantial number of trades. The program is expected to save hundreds of millions of dollars compared to the command alternative.

**Ozone depleting chemicals**

The United States has successfully initiated an emission trading system to provide firms with flexibility in the phase-out of chlorofluorocarbons (CFCs) and other ozone-depleting substances as required by the Montreal Protocol and subsequent international agreements. Because the number of producers is small, the number of trades has been limited, but it appears that the program has yielded appreciable cost savings and provided firms with beneficial flexibility in complying with the phase out schedule.

**EPA emissions credit trading programs**

The **EPA** has introduced several emissions credit trading systems to provide a degree of flexibility within the command regulatory system for air pollution control. The Clean Air Act prohibits new sources of air pollution from locating in polluted regions unless compensating reductions are achieved from existing sources; under the **EPA**’s offset program, new sources can contract with existing sources to reduce their emissions and provide offset credits to the new sources. Under the “netting program,” an existing source may add a new unit that generates emissions and achieve compensatory reductions in emissions from existing units without triggering new regulatory controls. Under the “bubble” program, an existing source within a given facility can reduce its emissions below the level required by current regulations and transfer the emissions credit to another source within the same facility or a different facility, enabling it to increase its emissions.

The netting program, which involves a form in internal trading, has been widely used and has resulted in many hundreds of millions of dollars of cost savings without impairing air quality. The other programs have been less successful. There have been very few offset trades, and bubble trades have been limited. A major reason for this modest performance is that the **EPA** requires advance regulatory approval of each trade, creating delay, uncertainty, and high transaction costs. In addition, there are restrictions on trades to ensure that there is no worsening of air quality in any location even though air quality standards would not be violated. By contrast, the lead, **SO₂**, and ozone depleting substances trading systems do not require advance regulatory approval and impose no restrictions on trades. They establish a uniform, homogenous commodity in the form of credits or allowances, promoting the development of trading markets and attendant cost savings.

5. **The reclaim** Program restricts trading among different zones in the Los Angeles air quality region in order to prevent increased concentrations of pollution in a given locality.

**The lessons learned**

The formulation process for international market-based mechanisms for limiting net GHG emissions can and should benefit from the U.S. domestic experience. U.S. experiences demonstrate that emissions trading systems for diffuse pollutants can work effectively to protect the environment, provide needed flexibility in the means of control, and achieve significant cost savings if such systems are properly designed and enforced. These flexibility and cost advantages have been instru-
mental in securing agreements on more ambitious environmental protection and control objectives than would be possible under a command system. Further, this experience shows that a quota or credit trading system should be designed so as to minimize transaction costs and facilitate trading by making the commodity traded homogeneous, and eliminating or minimizing the need for advance government approval of trades. U.S. programs have illustrated that it is feasible - at least at the national level - to design and implement such systems without significant additional administrative expenditure over a command system. These experiences also demonstrate the necessity of establishing a strong system of monitoring and enforcement to ensure the integrity of the market and the achievement of environmental protection objectives.

**How can emissions trading systems be used to limit net greenhouse gas emissions?**

Emissions trading systems are well suited to deal with the challenge of limiting net GHG emissions. GHGs are globally mixed throughout the atmosphere, eliminating any problem of local pollution “hot spots.” Accordingly, it is irrelevant from an ecological perspective whereon the globe limitations on net emissions are achieved. Also, the cost savings from using emissions trading to combat climate change are enormous. There are many different types of facilities and activities that generate GHGs. Differences in the current state of capital plant and technology, economic structure, geographical and ecological factors, the stage of development, and available substitutes create very large differences in the costs of controlling net GHG emissions among different economic sectors and different nations. Opportunities for activities to sequester GHG cost-effectively also vary widely. The potential costs of limiting net GHG emissions are huge, running to tens of trillions of dollars over coming decades. It is therefore extraordinarily important that limitations be achieved in the most cost-effective fashion, provided that such limitations are also equitable and enforceable. Reducing the costs of achieving limitations can promote the likelihood of successful international agreement on and implementation of limitations measures.

Emissions trading systems can further these objectives by capitalizing on differences in the costs of limiting emissions or enhancing sinks in different sectors and nations, and steering investments to the lowest cost GHG-reducing opportunities. For example, insisting that each Annex I country undertake steps to limit emissions in order to meet its Protocol obligations entirely through internal limitations is a form of command regulation that treats each nation as a discrete source and imposes a fixed quantitative limitation on its emissions. The flexibility afforded by international trading could greatly reduce costs by allowing some emissions limitations activities to be shifted from countries with high control costs to those with low control costs. The high control cost countries would

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finance, through the trading system, the additional controls in the low cost countries. Use of trading could reduce the costs of achieving the Kyoto Protocol emission limitations by 80% or more compared to systems without trading, generating trillions of dollars of savings. Overall targets would be met. In order to achieve these cost savings, governments should not be solely responsible for identifying and realizing the best and lowest cost emissions limitation opportunities. Private sector capital, technology and business experience is necessary for the efficiency and effectiveness of such a trading system. This can be achieved by allowing business firms and other legal entities to participate in trading, subject to internationally agreed standards and procedures, as specifically envisaged by the CDM provisions of the Protocol.

The development of an emissions trading system among Annex I countries, as provided by Article 17 of the Protocol, would generate large cost savings. These savings would help to ensure that the Annex I countries meet their emissions limitation obligations under the Protocol and facilitate further agreements on reductions following the first commitment period. Furthermore, as recognized in Article 12 of the Kyoto Protocol, there are powerful reasons to include developing countries, which are not subject to emissions limitations obligations, in a CDM trading program with Annex I countries that would allow industrialized countries to meet a portion of their emissions limitation obligations by investing in developing country projects to limit emissions or enhance sinks. It should be emphasized that any participation in CDM trading is entirely voluntary on the part of a developing country. There are four important benefits that the CDM trading system would provide for developing countries:

- First, CDM trading could channel potentially large amounts of capital and technology to developing countries to enable them to modernize plant and equipment and develop economically. In this regard, the participation of private entities in a trading and investment program, as specifically provided for in Article 12 of the Protocol, would be essential. The private sector is currently responsible for over 85% of external direct investment in developing countries. The amount of bilateral and multilateral assistance from developed to developing countries is limited and cannot be expected to increase significantly in the near future. Tapping large amounts of new and additional private sector investment through a CDM trading system would be a major contribution to economic modernization and growth in developing countries.

- Second, trading projects in developing countries that limit GHG emissions could provide social as well as environmental benefits. For example, projects to enhance energy efficiency or switch to cleaner fuels will reduce emissions of sulfur dioxide, particulates, and nitrogen oxides, providing significant health benefits to local populations.

- Third, providing for voluntary participation by developing countries in a trading system with the Annex I countries would generate large additional cost savings over and above those that could be achieved by an arrangement that allowed trading only among Annex I countries. Many developing countries lack modern technology and use energy inefficiently. As a result, large emissions limitations can often be achieved at a lower cost by investment in modernization and new technology in developing countries rather than by imposing additional controls on sources in industrialized countries. There are often larger differences in control costs between Annex I countries and devel-

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7 See William D. Nordhaus and Joseph B. Goyer, Requiem for Kyoto: An Economic Analysis of the Kyoto Protocol (1998) (estimating that while the abatement costs of the Kyoto GHG reductions would be approximately US$276 billion annually under a scenario that allowed global tradable emissions, abatement costs in the absence of trading would be US$1.97 trillion).

8 Article 12(a) provides that participation in the CDM, including acquisition of CERS, “may involve private and/or public entities.” Annex I countries, in adopting domestic regulatory systems to achieve their emissions limitation targets under the Protocol, would give credits to domestic non-governmental entities that participate in trading credit against their domestic regulatory obligations for emissions reductions achieved by reductions in other countries that they finance, thereby providing the necessary incentive for private investment in emissions reductions in such countries.
opining countries than among the Annex I countries themselves. CDM trading will further reduce the costs of meeting emissions limitation obligations for the Annex I countries and thereby make it more likely that these countries will be able to meet their existing obligations. In addition it will increase the probability that Annex I countries will agree to additional and more demanding emissions limitation obligations in the future. Thus, CDM trading could help achieve greater limitations on GHG emissions, to the particular benefit of developing countries, which are especially vulnerable to the adverse effects of climate change.  

- Fourth, CDM emission reduction credits against the Annex I countries’ emissions limitations obligations during the first commitment period can be earned by Annex I countries beginning in the year 2000. This feature will provide incentives for early investments by Annex I countries in GHG emissions reductions through the CDM, effectively producing additional economic and environmental benefits for developing countries, and possibly enabling further reductions.

How would an emissions trading system among Annex I countries work?

Some basic legal and institutional arrangements are necessary for establishing a system for trading emissions allowances among Annex I Parties. Such a system could be established to become operational during the first commitment period, from 2008 to 2012, as authorized by Article 17 of the Protocol. Alternatively, it could be instituted in the period prior to 2008 by a voluntary “early action” agreement among those Annex I countries that chose to participate, on terms consistent with the Convention and Protocol. Annex I countries participating in such systems would be subject to national caps on their emissions. In a trading system established under Article 17 of the Convention, the caps would be those set by the emissions limitation obligations imposed by the Protocol. In the case of a voluntary pre-2008 early action trading system, they would be established by the voluntary agreement of the participating countries.

Under an allowance trading system, each participating country would be allocated allowances (net emissions quotas) equal to its agreed-upon net GHG emissions cap. Allowances would be expressed in tons of CO\textsubscript{2} or the equivalent. Allowances could then be freely bought and sold. Allowances could be issued on an annual basis, as under the U.S. sulfur trading program, for use in the year of issuance or a subsequent year. Inter-temporal flexibility could be achieved by authorizing banking of unused allowances for future use and providing for a futures market to allow borrowing against allowances to be issued or made available on the market in the future. Alternatively, allowances could be issued on a multi-year basis and used in any year during the period. The latter is effectively the approach taken by the Protocol for the first commitment period.

Parties to such a trading system would commit to ensuring that their net emissions for any given accounting period did not exceed their agreed-on cap for that period, plus any allowances obtained from others, minus any allowances transferred to others. Parties would enjoy the flexibility of determining how they would choose to implement this commitment. Many Parties might choose to establish domestic systems of trading in allowances or emission reduction credits. These domestic trading systems would feed into the international trading system through trades between private entities in different countries, and facilitate devel-

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9 Concern has been voiced that participating in trading will be to the long-term disadvantage of developing countries because the Annex I countries will invest in the lowest cost emissions limitations projects—the “low hanging fruit”—leaving only higher costs projects available if and when developing countries assume emissions limitations obligations. The factual basis for this concern is quite doubtful. Most developing countries are making major investments in energy generation and distribution and other industrial and service infrastructure. These investments are being made now and the capital invested will be in place for many years. These investments present opportunities for emissions limitations that ought not to be postponed for the future. If, however, a particular developing country nonetheless concludes that participation in CDM trading is not in its interest, it can simply decline to do so.


11 The relevant agreement would establish a system for indexing emissions of different gases and sequestration projects in terms of CO\textsubscript{2} equivalents. Initially some sectors, gases, or sinks might not be included in the system at all because of severe monitoring and verification uncertainties or difficulties, although these should be overcome in time. See Richard B. Stewart and Jonathan Wiener, “The Comprehensive Approach to Global Climate Policy: Issues of Design and Practicality,” 9 Arizona Journal of International and Comp. Law 83 (1992).
opment of a “thick” international trading market with many participants. Alternatively, Parties might choose to employ command regulations, emission taxes, or other measures to limit net domestic emissions in at least some sectors. These strategies could involve the issuance of tradable emission reduction credits to domestic entities that reduced emissions below the levels required by command regulation.

Parties participating in an international trading system would be required to:

- Monitor and report their net emissions to international authorities in accordance with agreed-upon procedures and protocols and submit to specified inspection and monitoring activities by such authorities;
- Participate in and honor a system of accounting by international authorities of holdings and trades of emissions allowances;
- Respect free trade in allowances and refrain from expropriating them, while adopting appropriate domestic legislation in order to implement the international trading system; and
- Participate in and abide by the outcome of dispute settlement procedures established by the agreement.

International entities, established pursuant to the FCCC and Protocol or a pre-2008 agreement, would have to carry out three essential functions to ensure the successful working of a trading system.

- First, an international authority would have to establish basic procedures and rules for registering and trading allowances or credits, and keep accounts of trades and current holdings. It is thought that trades would not actually be carried out through such an entity, but by one or more exchanges and through non-exchange transactions in accordance with trading regulations that it establishes.
- Second, the same or a different international authority would establish and oversee monitoring and verification of the Parties’ net emissions. It would establish procedures and protocols for reports by parties of their net emissions for each accounting period. The authority or other public or private authorized entities would receive and review these reports; engage in independent monitoring and inspection activities as authorized by the agreement; and certify each Party’s net emissions for each accounting period at the close of that period.
- Third, an international authority would have to establish a system for resolving disputes regarding the trading system, including issues regarding parties’ compliance, and institute sanctions or other remedies for non-compliance.

Parties would be responsible for ensuring compliance by their domestic sources with measures so as to limit each Party’s net emissions within its agreed-upon cap. Parties that failed to meet this obligation, and that failed to buy allowances in the trading market to cover their emissions deficit, would be certified as non-compliant by the relevant international authority at the close of the accounting period and would be subject to liabilities and sanctions. A sanction that could be automatically imposed for deficits would be to reduce the Party’s allowed emissions in the next budget period by an amount at least equal to its deficit in the prior budget period, similar to the U.S. sulfur trading system. Additional sanctions, including fines and exclusions from the trading system, could be authorized by the agreement that established the system.
If these measures assured high levels of compliance by Parties selling allowances, it would be appropriate to provide that sold allowances would remain valid in cases of occasional or temporary non-compliance by sellers. In this case, buyers of allowances would be fully protected. This approach would reduce investor risk and thereby promote trading. This is the approach of the most successful U.S. emissions trading programs. It has been argued, however, that international institutions may be too weak to enforce seller liability in the international context. If so, liability might be imposed on allowance buyers. This could be accomplished by, for example, discounting the value of their allowances pro rata by the percentage of non-compliance by the seller. There have also been proposals for shared buyer-seller liability.

In order to ensure a well-functioning market, one must address the potential problem of market power. Monopolization or other attempts to restrain trade in allowances can best be prevented by ensuring the widest possible market with many buyers and sellers, including large numbers of private entities. Any remaining problems of market power might be adequately addressed by domestic or e.g. competition law, although thought might be given to developing a form of international competition policy for trading pursuant to the international agreement establishing the trading system.

How would emissions trading work under the CDM?

Article 12 of the Protocol provides for a trading system between developed and developing countries. It provides that certified emission reduction credits obtained from CDM projects in developing countries during the period from 2000 to the first commitment period 2008-2012 can be used to meet Annex I countries’ obligations during that period. Thus, Article 12 designates the CDM as an “early action mechanism” that will provide inducements for investments in developing countries and environmental benefits beginning in 2000. Operationalizing the CDM is, however, a complex task both politically and administratively. It involves a number of circumstances and considerations that are different from those in a trading system among Annex I countries. It will, of course, be necessary to establish a structure for governance of the CDM that will safeguard the interests of the participating Parties, especially developing country Parties. Under Article 12.4, the CDM is to be “subject to the authority and guidance” of the Conference of the Parties (COP) to the FCCC and the Meeting of Parties (MOP) to the Protocol, and is to be “supervised” by an Executive Board. It must again also be emphasized that participation in the CDM is entirely voluntary.

Developing country parties, unlike Annex I countries, are not subject to emissions limitation obligations. This means that the CDM trading system cannot be based on tradable emissions allowances or quotas. Instead, credits must be awarded for emissions reductions achieved by specific projects. This is the system established by Article 12.5 of the Protocol, which requires the COP/MOP to designate “operational entities” to authenticate Certified Emission Reductions (CERs) for projects in developing countries financed by Annex I Parties and their private entities. In order to be certified, projects must provide emissions reductions that are additional to any that would occur in the absence of the project and that provide “[r]eal, measurable and long-term benefits related to the mitigation of climate change.” In addition, under Article 12.7, the COP/MOP must provide for independent monitoring and verification of project activities, through “modalities and
procedures with the objective of ensuring transparency, efficiency, and accountability,” to ensure that CERs are valid. There must also be bookkeeping arrangements to track CER holdings and trades. The system for certifying and recognizing CERs should be designed to maximize their fungibility in order to provide for the widest possible trading market.

Active discussions are currently in progress, through the Convention’s Subsidiary Body for Implementation and meetings of the COP/MOP, on the detailed design of the CDM and the criteria and procedures for determining project eligibility and certification of credits. It must be emphasized that the CDM is not a single organization. Rather, it is a legal and institutional system that includes a variety of entities, including Parties, the Executive Board, and a variety of international institutions and non-governmental entities. The role and relations among these various entities will have to be further defined. It also includes rules, standards, and procedures linking these components together in fulfillment of the CDM’s objectives, as set forth in Article 12.2 of the Protocol: to assist developing countries in achieving sustainable development and in contributing to the ultimate objective of the Convention and to assist Annex I parties meeting their emissions limitation obligations. With regard to the latter, Protocol Article 12.3(b) provides that Annex I Parties may use CERs to “contribute to compliance with part of their” Protocol emissions limitations requirements. Thus, an issue that must be addressed by the COP/MOP is whether to impose any limitations on such use of CERs and, if so, how any such limitations should be defined.

A central purpose of the CDM is to mobilize private capital to help fund projects in developing countries that will promote sustainable development and help mitigate climate change. Article 12.9 of the Protocol explicitly mentions the participation of private entities in the CDM. Thus, the CDM’s operational modalities and criteria must harmonize environmental and economic considerations. The environmental integrity of CDM projects and of the CERs that they earn must be assured. At the same time, investors require clarity and consistency of rules through a CDM framework with maximum transparency and minimum subjectivity.

Additionally, it will be necessary to provide assistance to developing countries for building analytical, legal, and institutional capacity to participate effectively in CDM trading. Such assistance might be appropriately provided by entities such as the World Bank, the regional development banks, and the UN Commission on Trade and Development (UNCTAD). There is a danger that without such capacity building, the CDM could simply replicate forms of development capitalism that are considered exploitative by observers in many developing countries. Capacity building, in its broadest sense, should involve a concerted campaign of information dissemination about current project finance tools for local developers and financiers and government officials involved in the CDM process. It will be essential to build host country capacity to understand the CDM and negotiate project terms, including the allocation of CERs. This could be done through multilateral and/or bilateral funding, by developing standard project contracts for guidance, and by initiating regional pilot projects and support capacities.

An important set of issues relates to the criteria that a project must satisfy in order to be eligible to earn CERs. It is intended that there will be a process for registration of projects upon a determination of CDM authorities that they meet criteria of eligibility. Under Protocol Article 12.5, undertakings must secure “[r]eal, measurable, and long-term” climate benefits and achieve reductions in emissions that are
“additional to any that would occur in the absence of the certified project activity.”
Active discussions are underway on operationalizing these criteria. It is widely agreed that financial investments in CDM projects must, in order to earn CERs, be additional to official development assistance, global environmental funds, and existing Annex I Party commitments to developing countries. Also, as noted above, a basic purpose of the CDM is to assist developing countries in achieving sustainable development. This raises the issue of what criteria of sustainability projects must satisfy, and whether project sustainability determinations should be made solely by the host countries in which projects are located, or whether international CDM authorities should also have some role. In any event, the host country must, in all cases, approve a project in order for it to qualify under the CDM.
Protocol Article 12.8 provides that a share of the proceeds from certified project activities is to be used to cover the CDM’s administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adoption. Measures must be taken to operationalize these provisions.

Certification of Emission Reduction Credits
In order to determine a project’s CERs, one must first determine the extent of the emissions or sequestration services that a project will generate. A certifying authority must also establish a baseline that defines the level of net emissions that would have occurred had the project not been implemented. The difference between the baseline and the net emissions generated by the project determines the amount of the credit. The determination of both a project’s net emissions and its baseline present difficulties. This, in turn, raises the question of when, how and by whom CERs should be determined.

One approach is to certify a project’s credits in advance (ex ante certification) based on its expected net emissions. In many instances, however, projects will be designed to operate over many years, requiring a degree of predictive uncertainty and a risk of future project failure. The ex ante certification system is based on the certification of a stream of future credits over a period of years, the amount of which is derived from best possible predictions. If a project fails to generate the anticipated credits, then liability would be imposed on the project sponsor, the buyers of credits, or both. Another approach is to certify credits only after the project is operational, based on its actual emissions performance (ex post certification). Under this approach, CERs would be issued periodically during the life of the project at the end of each of a series of accounting periods, such as every one to two years. The advantage of ex ante certification is that it reduces investor risk and facilitates securitization of the credits expected to be earned by a project over its lifespan, whereby financial intermediaries could capitalize the value of the lifetime stream of project credits and provide the capital to the project sponsor to cover the initial investment costs. The disadvantage of ex ante certification is that it creates environmental risk and complications in sorting out liabilities when project performance falls below predictions. There is a growing consensus in favor of ex post certification. It is believed that if a baseline can be established at the outset of the project, investor risk will be sufficiently reduced to allow securitization of the CERs that a project is expected to earn over its operating life.

Establishing the baseline for a project, however, is a complex, and often-controversial undertaking. Consider, as examples:

12 Case-by-case determination of baselines is one of the problems that have been encountered by Joint Implementation (JI) projects and Activities Implemented Jointly (AIJ) projects involving investments by one country or its private entities in another country to reduce net GHG emissions.
- A project to switch an electricity generating plant from coal to natural gas - would the switch have occurred anyway, because mandated by domestic environmental regulations?
- An investment in a more efficient electricity distribution system - would the system have been upgraded anyway purely for economic reasons?
- A project to preserve a forest slated for cutting - will the cutting simply be shifted to another forest that would not otherwise be cut?

The last example exemplifies the problem of “leakage,” in which a project considered in isolation reduces net GHG emissions but indirectly causes increases in other locations and sectors. It would be highly desirable to develop, insofar as practicable and appropriate, generic rules of thumb to resolve these baseline issues. This could be accomplished by developing international benchmarks rather than attempting to determine baselines on a project-by-project basis, which would elevate administrative costs and uncertainty. For example, an international benchmark could specify a given level of energy efficiency that would normally be achieved in a given type of new project, such as an electricity distribution system in developing countries at a given level of development. This benchmark would then establish the baseline to determine the extent to which a CDM project that creates a more efficient electricity distribution system would reduce GHG emissions.

The design of the CDM’s investment functions

A key issue in the implementation of the CDM is the design of its investment function. Protocol Article 12.6 provides that the CDM shall “assist in arranging funding of certified project activity as necessary,” but does not specify how this function is to be discharged. A variety of potential approaches have been discussed.

The centralized fund model

Under a centralized fund model, the CDM would constitute the sole or primary source of investments in CDM projects in developing countries. It would review, evaluate, and select projects proposed by developing countries for funding. Projects could be developed directly by a developing country, or by private entities with the approval of the host developing country. Investment funds for projects would be contributed to the fund by Annex I governments or by private entities seeking credits against their international or domestic obligations. Instead of approaching host countries directly, investors would buy CERS from the CDM itself, thus channeling moneys to host countries that have submitted individual projects or “bundles” of projects to the CDM for approval and certification of credits. The Parties participating in the CDM, particularly Annex I Parties, would presumably have to provide an initial capital contribution, but thereafter financial contributions to the CDM would consist primarily of the receipts from CERS sold to Annex I private entities. Most of these receipts would channel back to the developing countries and local project sponsors providing the CERS. This model would require that the CDM have a substantial institutional infrastructure to carry out a wide variety of functions, including:

- project identification and selection;
- marketing of project investments; and
- financial and investment management.
A central investment entity could, in theory, enjoy advantages through specialization and the ability to realize scale economies. It could develop the capacity and experience to assess and select worthwhile projects. It could diversify risk for investors by spreading investments across a portfolio of projects. The fund approach would also “shield” host countries from direct “buying” and “selling” of CERs. It could help to meet developing country concerns over their ability to control investment flows and their impacts on their countries. It would also meet equity concerns by channeling funds to those developing countries who might be comparatively unsuccessful in attracting investment through a market-based system. This approach could also create the potential for a secondary market in certified credits.

The centralized fund model also has a number of significant disadvantages:

• Its reliance on a single centralized bureaucracy operating in a somewhat political setting is likely to produce significant inefficiencies. Such an organization would face difficulties in generating accurate and timely information about the costs and risks of various investment alternatives.
• It would also have problems providing appropriate incentives for the fund’s administrators to adopt measures that will achieve GHG reductions at least cost.
• A single funding and investment entity would be a CDM monopoly, to the potential disadvantage both of investors and project sponsors.
• The CDM would have a financial stake in both the success of its projects and the continuing value of CERs. This would create a troubling conflict of interest.

These factors could significantly inhibit the influx of additional private investment into developing countries through the CDM.

The decentralized transactions model

Under this model, the CDM would define basic ground rules for the creation of credits and credit trading. In contrast to the fund model, however, the selection and financing of CDM projects and the resolution of issues concerning the allocation of project benefits and risks would be accomplished through negotiation and agreement among the Parties and the non-government entities involved in particular projects. Under this approach, the CDM would be designed to ensure that investor and host countries (and their respective private sectors) are given the maximum amount of choice to select and finance CDM projects. Financial transactions and CER sharing would be determined flexibly, project by project, with minimal interference from a centralized international bureaucracy.

Under this model, the CDM authorities would be responsible for establishing the basic criteria and procedures for approving projects as qualified for CERS and certifying the credits that they generate. The CDM authorities would also strive to anticipate the needs of buyers and sellers (including host countries) and provide services to facilitate trade between them and reduce transaction costs. They could do this in a variety of ways, including:

• organizing a web project “bazaar” or electronic bulletin board for CDM project opportunities and investor interests;
• publishing details of projects for dissemination, etc.; and/or
• trying to match donors with suitable projects and vice versa.

Using these means, the CDM authorities would seek to meet the provisions of Article 12.6 which specify that the CDM “shall assist in arranging funding of certi-
fied project activities as necessary.” The CDM would also require an independent certification, monitoring, and verification process to generate environmental integrity and business confidence in the system. If successful, this approach could generate vigorous primary and secondary trading markets in CERs and promote efficiency and cost-effectiveness.

There are, however, a number of potential disadvantages to the decentralized transactions approach:

- The COP/MOP and CDM Executive Board would remain in charge of the overall design and implementation of a decentralized system. Despite this, this system might fail to provide sufficient governmental control over investment decisions to meet the concerns of some developing country Parties, including those who fear that a decentralized approach would not ensure that they would receive sufficient CDM investments.
- This model would also have to overcome the problems that have plagued Joint Implementation (JI) and Activities Implemented Jointly (AIJ) projects. These projects have been quite limited because no credit could be obtained for project emissions reductions against international emission limitation obligations. The Protocol resolves this problem by providing credit for CERs against Annex I Parties’ obligations. However, the CDM would still have to address the high transactions costs involved in a decentralized process of identifying projects, identifying and bringing together investors, project sponsors, and host countries, and negotiating project agreements. In the JI/AIJ experience, these transaction costs have often equaled or exceeded the cost of the project itself. It remains to be seen the extent to which these costs can be reduced under the CDM by establishing central or regional clearinghouses and electronic bulletin boards to reduce investor-host search costs, and by taking steps to promote a primary market in CERs.

The unilateral host country model

Under a unilateral model, the host country would both develop and invest in a project and hold the sole or predominant equity interest. This arrangement would allow a developing country to identify and invest in a project in its own country and then sell or bank the CERs that the project generates. This model could promote host country autonomy and financial reward. It would also maximize host country control over projects and assurance that projects would meet the host country’s sustainable development goals. On the other hand, the Unilateral Model requires considerable host country project development and financial capacities, as well as ready availability of extensive private sector debt financing. At present, many developing countries may be unable to meet these requirements.

The mutual funds model

Another model would rely on a system of mutual funds. The CDM authorities would provide for and encourage participation of a substantial number of financial intermediaries, established by multilateral development banks, host countries, non-governmental organizations (NGOs), and private firms. An example of such a mutual fund is the World Bank’s Prototype Carbon Fund, which is designed to pool private and public capital for investments in CDM projects. Under this approach, a variety of international, governmental, and non-governmental entities would provide portfolios of GHG emission limitation projects in which governments or pri-
Private sector entities could invest. As such, it would provide economies of scale, reduced transactions costs, and diversification of risk for investors, like the fund model. However, unlike the single Fund model, the Mutual Funds Model would allow many different governments, organizations, and entities to offer such funds. The CDM would not offer mutual funds itself, but would be limited to promoting their development by others and ensuring the integrity of the credits offered.

This approach would eliminate the conflict of interest problem and significantly reduce the market power dangers inherent in the model of a single fund offered by the CDM itself. However, there are questions as to whether, at least initially, the demand and supply for CERS would be sufficient to support a system of multiple mutual funds. In addition, there would be a need to address developing country concerns by ensuring that there would be sufficient governmental control over the local impacts of investment and financial decisions. This concern might be met by assuring the regional development banks a substantial role in the mutual funds approach, while allowing host countries and private entities that wished to offer funds independently to do so.

**Mixed approaches**

A variety of other mixed or intermediate approaches that combine elements of the various models outlined above. The CDM could seek to promote a variety of investment approaches simultaneously. For example, it could offer its own mutual fund while encouraging the development of similar mutual funds by others. It could also provide support for decentralized project-by-project transactions between investors and hosts while promoting the development of mutual funds for some of these transactions. Host countries could offer CERS from projects that they undertake to the international investor community through mutual funds as well as on an individual project basis. The CDM should, in any event, provide a substantial role for market-based approaches in order to mobilize private capital into CDM project investments on a large scale. Also, the investment functions of the CDM should be designed so as to attract investments in CDM projects from the widest possible array of commercial and concessionary funding sources. CDM project capital can potentially be provided by a wide variety of sources, not exclusively GHG emitters. Rules and guidelines for the CDM should accommodate this flexibility, especially if it is to attract domestic investments in host countries and encourage the use of concessionary multilateral funds as well as international private capital to meet the sustainable development objectives of the CDM.

**Equity issues**

An important question related to equity is the extent to which an unfettered capital market will prioritize financial flows to CDM countries, sectors, or markets that are regarded as high risk or otherwise less attractive from a purely market investment perspective. To maximize participation of developing countries, international and domestic policy guidance must explicitly recognize that developing country motivation for the CDM is to increase capital and technology flows into sectors that implement their development priorities. One solution is capacity building. But other measures may well be needed. Current discussions in the Subsidiary Body for Implementation have emphasized the need for modalities and procedures for project eligibility that will ensure that CDM investments take place in countries that are often marginalized by purely market-based approaches.
There has been discussion of an Equitable Distribution Fund, funded by the industrialized countries, to provide needed finances for CDM projects, taking into account the geographic distribution of existing and planned CDM projects and the comparative need of regions and countries to receive assistance in achieving sustainable development. It has also been suggested that in some cases there will be a need for public sector finance from sources such as the Global Environmental Facility (GEF), the World Bank, or the International Finance Corporation (IFC), to catalyze projects, particularly those in countries with poor institutional capacity or high-risk ratings. Using concessionary finance also provides an additional mechanism by which a host country could direct investment flows, by selecting multilateral funding for projects deemed within economic or sustainable development objectives. Another equity issue is whether the CDM should have a role in determining how the CERs generated by a project should be shared among investors, project sponsors, and host governments.

Other functions of the CDM

The design of the CDM’s investment function will have important implications for the Executive Board regarding size, organizational structure, and Board member qualifications. In any event, the Board should be small enough so that it can carry out its managerial and other functions efficiently. It should also be subject to the authority and guidance of the COP/MOP. In addition, the CDM will have to arrange for a number of key functions to be executed, however its investment function is structured.

- First, it will have to provide for “operational entities” for certification of net emissions reductions achieved by projects. If, as it is hoped, there is a large number of projects, it would be impractical for the CDM itself or some subordinate entity to certify all projects centrally. Certification would be more appropriately implemented by host countries or private entities under procedures and criteria established by the CDM, using a process that is subject to appropriate review and supervision.

- Second, the CDM will have to provide for monitoring of a project’s emission or sequestration services and reporting of the monitoring results. In the first instance, monitoring will be appropriately carried out by the project sponsor. The results could be reported to the same entities responsible for certification of CERs, such as host country governments or designated private entities. The procedures and requirements for monitoring would be established by or under the direction of the Executive Board.

- Third, in order to ensure that monitoring is accurate and that projects actually generate the credits that have been certified, a verification system would have to be established for CERs. Under Article 12.7, verification must be carried out by an entity independent of those engaged in certifying a project’s credits. Such entities could include international organizations, private entities, and NGOs. They would follow procedures and criteria established by the CDM, and would also report to the CDM.

- Fourth, the CDM would have to arrange for a system for recording the issuance of CERs and keeping account of CER holdings and transfers.

- Fifth, independent entities, such as private accounting firms, would have to audit CER accounts.

- Sixth, it would be highly desirable to promote markets in CERs in order to
ensure that they are used to their fullest potential and that they facilitate CDM investments. There should also be arrangements for providing insurance against project failure for project sponsors, credit buyers, or holders who desire it. These tasks would likely best be carried out by the private sector.

In order to stimulate CDM investment, the CDM must ensure accurate certification, verification, and auditing in order to maintain the integrity of CERS. These functions, carried out in a uniform, consistent fashion, would ensure the homogeneity and fungibility of CERS from different projects and host countries. Insofar as feasible, the CDM system should also be designed to be compatible with the Annex I trading system. The same criteria should be used for certifying net emissions (in the Annex I allowance trading system) or CERS (in the CDM system). The same methods of bookkeeping should be used for trades and holdings of allowances and funding for CERS. By promoting the fungibility of allowances and CERS, these steps could help ensure the widest array of opportunities for investors and the most cost-effective emissions limitation projects.

A further set of fundamental issues relates to institutional procedures to resolve disputes among both State and non-State entities participating in the CDM. The CDM represents a highly innovative private/public partnership model of international law and organization. To function efficiently, there will need to be one or more dispute settlement mechanisms built into CDM. These instruments will have to deliver clear and determinative decisions in a speedy and cost-effective manner. This is especially important if the private sector is to be attracted to participating in projects on a large scale.

**Conclusion**

Experience demonstrates that emissions trading systems, when properly designed and implemented, can provide significant environmental and economic benefits over traditional regulatory approaches. Emissions trading systems are especially well suited for addressing climate change because they achieve limitations of net greenhouse gas emissions at far less cost and stimulate innovation in environmentally friendly paths to sustainable development. In recognition of these advantages, the Kyoto Protocol authorizes emissions trading among Annex I countries, and, through the CDM, between Annex I countries and developing countries. The CDM will provide a number of important economic and environmental benefits to developing countries by stimulating substantial additional inflows of private investment. If properly implemented, the CDM will ensure that the developing countries’ participation in these arrangements is truly voluntary, on equitable terms that will provide sufficient control by host countries of investment projects to assure that they promote developing countries’ interests and sustainable development objectives.
Richard B. Stewart is the Emily Kempin Professor of Law at New York University School of Law and Director of its Center on Environmental and Land Use Law. An internationally recognized expert in environmental and administrative law, he has published widely on the intersection between theory and practice in environmental law and the need to develop innovative methods, including market-based systems for environmental protection. Stewart has been Byrne Professor of Administrative Law at Harvard Law School, Assistant Attorney General for the Environment and Natural Resources of the U.S. Department of Justice, and Chairman of the Environmental Defense Fund. He has served as a consultant to the Environmental and Resources Protection Committee of China’s National Peoples’ Congress in drafting new environmental laws for China, and a consultant to UNCTAD on the legal and institutional issues involved in the development of an international greenhouse gas emissions trading system.

New York University School of Law
Vanderbilt Hall
40 Washington Square South, 411-k
New York, NY 10012-1066
Telephone: 212.998.6170
stewartr@turing.law.nyu.edu

Philippe J. Sands is a co-founder and the Director of Studies at the Foundation for International Environmental Law and Development (FIELD), and Co-Director of FIELD’s Project on International Courts and Tribunals. He is currently Professor of International Law at the University of London, School of Oriental and African Studies, and Global Professor of Law at New York University Law School. Professor Sands is a practicing barrister, at Matrix Chambers in London, and has tried cases before the International Court of Justice, the International Tribunal for the Law of the Sea, the International Center for the Settlement of Investment Disputes, and the European Court of Justice. His publications include Principles of International Environmental Law (MUP 1995).

FIELD
SOAS, University of London
46-47 Russell Square
WC1B 4JP London, UK
Telephone: +44.171.637.7950
Fax: +44.171.637.7951