

RISKY BUSINESS: LESSONS IN RISK MANAGEMENT FOR AN INTERNATIONAL GREENHOUSE GAS EMISSIONS MARKET

JAMES F. PERKAUS AND KEVIN A. BAUMERT

The devastating impacts of the Asian financial crisis of 1997-98 serve as only the most recent reminder that all liberalized financial markets critically depend on regulatory frameworks that incorporate sound risk-management principles. Some of these risk-management principles are also applicable to the emerging international greenhouse gas emissions market: establishing transparency and disclosure rules; properly sequencing regulatory policies (so safeguards are in place *before* large-scale international capital flows begin); and avoiding perverse incentives that result in excessive risk taking.

These risk-management principles are products of experience. Because they are neither sensational nor innovative, they do not grab headlines, and implementing them is a relatively thankless, tedious, and difficult task. Yet, their adequate implementation is absolutely indispensable to any environmentally sound, cost-effective regime of an international emissions trading system. This *Climate Note* illustrates how basic risk-management principles apply to international emissions trading. It also offers recommendations to facilitate their implementation.

INTRODUCTION

Policymakers increasingly invoke the power of markets to address environmental problems. This is, indeed, the case with global climate change. Many analysts and government officials have promoted international emissions trading as the most feasible way of managing the global atmospheric commons. This approach is incorporated into the 1997 Kyoto Protocol and into other proposed international frameworks for climate protection.¹

The allure of international emissions trading stems mainly from its potential to *cost-effectively* reduce greenhouse gas emissions. In this regard, market mechanisms have proven to be often superior to traditional domestic environmental regulations, increasing the momentum to bring powerful market forces to bear on the most challenging global environmental problems.

An international emissions market shares some basic features of more traditional financial markets, particularly those that cross international borders.

If implemented successfully, international emissions trading would represent an unprecedented achievement in international regulatory cooperation. But where there are high rewards, risks can be

equally high. An international emissions market will be complex and difficult to manage. It will often feature private sector actors, which will be regulated under the domestic legal systems of participating countries. Yet, the main subjects of the market will be countries with emissions obligations under international law. This situation could present many challenges. Unless an appropriate regulatory framework is developed for an international emissions market, future greenhouse gas goals will not be achieved, setting back efforts to combat climate change.

There is a lack of directly comparable environmental policy experience to draw upon, which increases the challenge to government negotiators and observers in shaping rules for an international trading system. However, emissions markets share some basic features of more traditional financial markets, particularly those that cross international borders. The experience of those financial markets provide some lessons that can help guide policymakers in building durable, stable, and efficient emissions markets over the coming decades.



Box 1 explains the basics of an international emissions market. Its features present daunting risk management challenges to market framers. Section I introduces the concept of risk management in constructing and maintaining financial markets, and explains how emissions allowances are likely to constitute a new class of financial instruments. Sections II through IV each focus on one risk management principle, which is illustrated from the Asian crisis and applied to an international emissions market. The *Note* ends with conclusions and recommendations.

I. FINANCIAL MARKETS AND RISK

A. Emissions Allowances: A New Class of Financial Instruments?

Emissions allowances—introduced in Box 1—are licenses that legally authorize the holder to emit a specified amount of greenhouse gases (e.g., one ton of car-

bon dioxide equivalent).² These licenses, of course, have an instrumental purpose: to limit the total amount of greenhouse gases churned into the atmosphere. Governments accomplish this goal by creating scarcity—that is, by limiting the amount of allowances in circulation. Scarcity, in turn, creates financial *value*. In some countries, the private sector will hold and trade allowances.

Allowances are essentially regulatory commodities³ created by governments for environmental management. Although a greenhouse gas allowance is not a traditional financial asset, it does share traits with currencies, stocks, bonds, and other financial instruments. These sorts of environmental markets already exist in some countries. The sulfur dioxide allowances traded through the U.S. Acid Rain program, for example, have characteristics similar to greenhouse gas allowances and, thus, traditional financial instruments. (*See Box 2.*)

Box 1

How Does International Emissions Trading Work?

No one is quite sure how international emissions trading will work, given the lack of experience and absence of a supportive international legal framework. However, considering analyses by governments and observers, we have a reasonable idea of how this might work. A framework for trading, generally, would proceed along the following lines.

The first condition is that governments adopt binding targets to limit or reduce greenhouse gas emissions. Each participating country's emissions must be restricted to a maximum allowable level.¹ The second condition is that each country's allowable emissions level will be divided into discrete, tradable units.² These tradable units are referred to as *allowances*, because they “allow” the holder to emit a specified amount of greenhouse gases, say, one ton of carbon dioxide equivalent.

Although not a necessary condition, a third important feature of an international emissions trading system is the involvement of private sector entities

within countries. Thus, governments could devolve their allowances to private emitters, which, in turn, could trade them domestically or internationally. Allowances could change hands in several ways—between governments, between government and private entities, and between private entities. Buying allowances enables one to emit more; selling those allowances requires one to emit less.

Finally, the trading system must have an ending date, where accounts are reconciled and regulators can determine whether the participating entities are complying with their greenhouse gas targets. At this time, all participating entities must hold allowances that are equal to, or in excess of, their actual greenhouse gas emissions.

For private entities, which are regulated by their respective national governments, the ending date might differ from country to country. Country A might have annual assessments of compliance, while Country B operates over a three-year span. The Kyoto Protocol, for example, establishes a five-year

compliance period, from 2008 through 2012. Thus, at the conclusion of 2012, each country will need to demonstrate that it has sufficient allowances to cover its actual greenhouse gas emissions.

Governments that exceed their national emissions target, and do not remedy their emissions excess, will be in noncompliance and can, thus, expect some sort of penalty. However, it is critical to point out that the penalties are likely to be soft at this international level, if history is any guide. Within national jurisdictions, on the other hand, it is possible to have strong enforcement provisions. Still, even here, many governments may lack the capacity to effectively regulate private entities, which could complicate immensely how to prudently manage international transactions.

¹ In the jargon of the Kyoto Protocol, all industrialized and transition (i.e., former command economy) countries have an “assigned amount,” which they must not exceed.

² Again, in Kyoto jargon, these units are referred to as “assigned amount units.”



Financial markets are invariably underpinned by regulatory frameworks that, if designed effectively, clarify the rules of the game and prudently manage risks. An international emissions market will be no exception.

Allowances could change hands in several ways—between governments, between government and private entities, and between private entities.

More broadly, *market- or systemic-risk* must be controlled through the design and management of entire regulatory frameworks. The Securities and Exchange Commission in the United States, for ex-

B. Risk and Risk Management in Financial Markets

Risk and risk management rarely capture headlines. Rather, the *failures* of risk management in financial markets are notable and newsworthy. Bank failures and government insolvencies, especially those that spread through “financial contagion,” inspire International Monetary Fund bailouts and government “rescue packages.” The U.S. Savings and Loan debacle in the 1980s, the Asian financial crisis, the collapses of notable banks and hedge funds are just some reminders of what happens when risk is poorly managed.

Risk, essentially, is quantified uncertainty. It is the chance of losing money, or that something in particular will go wrong.⁴ In spite of the notable breakdowns, investors, financial institutions, other market participants, and regulators routinely *manage* risk. Banks, for example, seek to minimize risk in their lending practices by taking active steps to scrutinize the creditworthiness of borrowers.

example, manages system-wide risks by regulating accounting practices and ensuring that companies provide information publicly, in a timely and standardized fashion. As an international emissions market develops, managing systemic risk is about establishing rules that best align the interests of market participants to promote compliance, thereby enhancing environmental integrity and cost-effectiveness. For instance, the major risk in an international emissions market is “rogue trading,” that is, intentionally overselling emissions allowances needed for compliance. Market power, liquidity risks, other forms of market manipulation, and incompatibility with domestic emissions trading systems could likewise have systemic repercussions that could damage confidence and increase compliance costs.

Managing systemic risk is especially critical in *liberal*, or newly *liberalizing* markets, where financial decisions are transferred largely from the government to private entities. To mobilize the large pools of capital needed to address climate change, the international emissions market will require what is essentially a liberal regulatory framework.⁵ In practice, this

Box 2

Sulfur Dioxide Allowances As Financial Instruments

Domestic environmental markets offer some insight into the financial dimension of greenhouse gas emissions allowances. The emissions allowances in the much celebrated U.S. Acid Rain Program (for controlling sulfur dioxide) behave similar to traditional financial assets. The Chicago Board of Trade, one of the world’s largest commodity futures exchanges, conducts an annual auction for two allowance classes—one for spot market (immediately usable) sulfur dioxide allowances and the other for those in the 7-year forward market. The auctions help discover accurate prices, provide liquidity, and establish con-

fidence among market participants on allowance availability.

Less prosaically, companies may also enter into “repurchase agreements,” where they lend their allowances for a specific time period (often almost a year) with a fixed repurchase date. To illustrate: in January of a given year, Company A has been allocated its annual supply totaling 1,000 sulfur dioxide allowances, which it does not need for compliance purposes until that December. It contracts simultaneously to lend the 1,000 allowances to Company B (a trading firm) and repur-

chases them along with an in-kind interest payment, resulting in 1,050 allowances (about a 5 percent annual return) being deposited in Company A’s account in December, well in advance of the regulator’s annual compliance deadline. The lender generates a return on an otherwise nonperforming asset; the borrower may perform numerous market functions, such as trading, contracting in the forward market, or brokering larger deals. Although repurchase agreements do not affect environmental integrity, they enhance market liquidity.



framework involves countries implementing national emissions trading programs of various shapes and sizes, authorizing private entities to participate, and issuing domestic emissions allowances that are interchangeable (i.e., fungible) internationally and traded at a competitively determined market price.

An important outcome of international emissions trading would be an accurate market price—a credible estimate of what it costs to keep a ton of carbon out of the atmosphere.

As the market deepens and the price gains greater accuracy over time, businesses will increasingly know whether to buy or sell allowances and how quickly to invest in carbon-efficient plant and equipment. The consequence of an accurate price is profound, as it would lead to efficiently allocating scarce capital to reduce greenhouse gas emissions. This would expeditiously instill carbon considerations into the trillions of dollars that continue to be sunk into the physical infrastructure of a world economy dependent on fossil fuels. How can this be done?

In liberalized markets, the government's role changes but does not disappear. The focus shifts to establishing regulatory frameworks to manage risks. The regulatory framework establishes the "rules of the game" and, if well constructed, promotes fairness, transparency, and accountability. This framework provides information to the marketplace and orients incentives systems in a way that minimizes risk. It is important to note, however, that systemic risk can never be eliminated, but only managed.

Market participants act (e.g., buy, sell, and hold) on the basis of information and incentives created by the regulatory framework. Timely and accurate market information, in turn, gives investors confidence to generate small pools of capital. This market behavior begins the process of price discovery. Accurate prices serve as a kind of quantitative proxy that, on balance, reflects the publicly available information about resource scarcity, risks, and opportunities. Built on the foundation of *arm's length* transactions,⁶ accurate prices incrementally encourage

more and more capital to be put into the market. Trading volume grows. This process cycles, producing increasingly accurate prices and higher volumes. In years or decades, it may culminate in liquid, thick markets with assorted participants: buyers, sellers, hedgers, speculators, and financial intermediaries. Figure 1 represents a structured relationship between a liberal market's regulatory framework and its capacity to mobilize capital.

Given its potential size, an international emissions market could generate a carbon price that represents a global benchmark, analogous to other global price benchmarks, such as North Sea Brent crude oil, Chicago soybeans, or the London interbank offer rate (LIBOR, for interest rates). Such an accurate and credible benchmark price for carbon would effectively send broader market signals that mobilize capital beyond emissions trading—to project-based trading systems such as the Clean Development Mechanism and Joint Implementation as well.⁷

Clearly, the benefits of a liberal international emissions market could be overwhelming. But such prodigious gains do not come free of charge. They require the proper management of risks within a liberal international emissions market. For this reason, turning an aspect of environmental protection into a liberal financial market is a scary concept to many people. This fear is well founded; ensuring that emissions markets deliver on their promise will be challenging indeed. After all, market failures caused atmospheric degradation in the first place. Why should we count on markets to bail us out now? And although the private sector is familiar with markets and financial management, emissions trading is hardly a core competency. Companies will use emissions markets only insofar as they are credible and liquid. What is more menacing is that emissions markets, like traditional financial markets, could break down, either gently or catastrophically through, say, intentional overselling of emissions allowances.

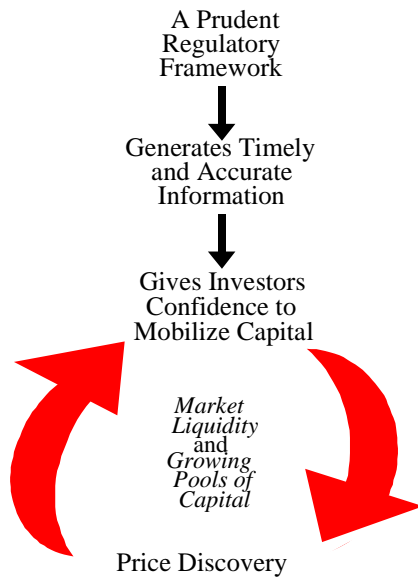
Failure of emissions markets could dramatically set back efforts to combat climate change. If the international community puts its faith in an emissions market to con-

The major risk in an international emissions market is "rogue trading," that is, intentionally overselling emissions allowances needed for compliance.



Figure 1

Regulatory Frameworks Promote Capital Mobilization



Source: World Resources Institute

trol climate change, the stakes will indeed be high. However, the potential public gains from a well-shaped trading system are also high, justifying creating a robust international emissions market. Constructing such a reliable emissions market is the theme of this *Note*.

C. Three Key Principles of Risk Management

Just as with more traditional financial markets, emissions markets must be built upon a prudent regulatory framework guided by principles of risk management. So, not surprisingly, we find that risk management principles drawn from traditional financial markets are also relevant to nascent emissions markets. Three principles are particularly key:

1. Promotion of transparency, information disclosure, and standards;
2. Appropriate sequencing of regulations; and
3. Avoidance of perverse incentives, whereby actors benefit by engaging in excessively risky behavior (i.e., avoidance of moral hazard).

The following three sections describe these risk management principles, using illustrations primarily drawn from the 1997-98 Asian financial crisis.⁸ The Asian crisis is the most potent reminder that divergence from these principles can have adverse consequences for financial markets and, more importantly, their participants. The principles are then applied to nascent emissions markets. Although financial markets are beasts with vastly different stripes, they all need to adhere to these three principles to function effectively.

These risk management principles also apply to existing emissions trading markets. As Box 3 explains, however, risks in existing markets are relatively easy to control. As a result, international emissions trading for climate protection may require alternative risk reduction remedies. In this regard, the risk management successes and failures of more sophisticated and experienced international financial markets provide helpful guidance.

II. THE IMPORTANCE OF TRANSPARENCY AND INFORMATION DISCLOSURE

Sunlight is said to be the best of disinfectants; electric light the most efficient policeman.

U.S. Supreme Court Justice Louis Brandeis, on transparency⁹

A. Principle in Practice

Whether trading currencies, bank loans, or securities, financial markets require reporting regulations, including holdings disclosures, balance sheets, and income statements. The reason is simple: disclosure and transparency requirements provide regulators, investors, and the public with the information needed to accurately assess corporate health, especially the value of a firm’s assets (e.g., its machines, inventory, and patents). Equally important, meaningful information must be standardized, according to quality, methodologies, and measurement units. Since most financial markets operate in a *buyer-beware* world, such sound information is a prerequisite for market confidence and accurate prices. As viewed by Arthur Levitt, former Chairman of the U.S. Securities and Exchange Commission, “Sound and verifiable numbers are to financial markets what oxygen is to breathing. Our financial markets simply cannot work without access to strong, high quality financial reporting.”¹⁰



Transparency, disclosure, and standardization can be elusive, particularly in the countries afflicted by the 1997-98 financial debacle that began in Asia. Lack of transparency and disclosure permeated the entire credit culture in many Asian countries. The practice of “connected” loans was particularly noteworthy, where banks lent to their own managers, directors, and affiliated businesses. In such systems, information flows are opaque. Market prices and interest rates carry little information and poorly reflect risks.

More specific disclosure problems plagued individual countries. For example, Thailand’s lack of reporting rules led to inadequate information on the performance of the housing market, such as starts, sales volume, prices, and nonperforming loans. As a result, substantial loans flowed into real estate and other “low return” sectors of the economy. As Dr. Somchai Richupan of Thailand’s Government Housing Bank observed, “The lack of adequate housing statistics prohibited the sending of strong and early warning signals to developers as well as financial institutions.”¹¹ At the same time, the unprecedented inflows fueled a consumer credit boom, mak-

ing Bangkok the largest market for Mercedes Benz cars outside of Germany.¹²

Similar examples abound across Asian crisis countries. Thus it is no coincidence that efforts have increased over the past few years—under the conspicuous banner of “international financial architecture” reform—to improve transparency, disclosure, and standard setting in international financial markets. The International Monetary Fund (IMF), for example, has instituted a series of programs designed to help countries facilitate transparency and disclosure. Through the General and the Special Data Dissemination Standards,¹³ subscribing countries produce and disseminate information about national financial and economic performance. In addition, the IMF-prepared national “transparency reports” amount to scorecards on how well countries perform under and abide by a range of voluntary international standards.¹⁴ Work continues on other international standards, including those in accounting, auditing, banking, and securities market regulation. Importantly, the standard-setting agencies are not only public agencies, such as the IMF,

Box 3

False Friends?: Lessons from Existing Emissions Trading Programs

Although it is tempting to blithely apply the rules of existing emissions markets to the prospective international climate markets, it could also be dangerous. To function effectively, international emissions trading will need to vastly exceed the scale and complexity of existing trading programs. The U.S. Acid Rain program, for example, offers invaluable lessons on liberalized markets, such as allowance denomination, market participants (e.g., including brokers and other financial intermediaries), and registries. However, it regulates a single sector and pollutant, operating within the secure confines of domestic law, where state power can be used to unequivocally punish noncomplying actors. International law, on the other hand, lacks the effective “big stick” of sanctions and fines to ensure that countries adhere to their commitments.

A type of allowance trading system also exists at the international level. The Montreal Protocol, which manages the phase-out of ozone-depleting substances (ODS), contains an “industrial rationalization” provision that authorizes the international transfer of ODS production and consumption licenses. Although some countries distribute these to their private entities, the market framework is hardly liberal. There are few market participants—a decade ago only about 20 manufacturers existed worldwide. The scale of activity is small—from 1989 to 1995 U.S. firms engaged in about 40 transactions with companies located in other countries. Regulators in at least one country must preapprove transactions. And noncompliance procedures focus on “facilitation” rather than enforcement.¹

Climate markets will involve public and private market actors, many hard-to-

measure gases and sectors, and a diverse array of countries with varying degrees of regulatory capacity and oversight. Importantly, trading will likely be on a substantially larger scale. As allowances cross national borders, they will enter new legal jurisdictions, wherein courts and legislatures may attach additional, possibly conflicting rights or burdens. Governments may expropriate emissions allowances, as well as restrict or prohibit their resale internationally. Or, as already noted, governments or their private entities may “oversell” their allowances. In short, most anything can happen, even political borders can change.

1 Fiona Mullins, *Lessons From Existing Trading Systems For International Greenhouse Gas Emission Trading* (Paris: OECD, 1998), pp. 25-33.



but also professional associations, such as the International Federation of Accountants.

Transparency in liberalizing economies means shedding light on companies, not just governments. Important examples that extend to domestic financial institutions are the Basle Capital Accord and the Basle “core principles”

for improving risk management and government oversight in financial systems.¹⁵ Transparency and disclosure together form one of the three pillars of the 2001 proposals to update the principles.¹⁶ The Basle principles allow investors, regulators, and credit rating agencies to see into the inner workings of banks, in order to assess their financial condition.

Certainly these and other efforts to improve financial transparency are not ideal. Regulations rarely keep pace with financial innovations, as market participants continue to find ways of taking and managing risks (through the use of derivatives and loan securitization, for example). Still, these standards and codes are steps in the right direction. Financial turbulence has highlighted the need to expedite their implementation as well as to insist on their periodic review and, if warranted, subsequent revision. These international standards and codes set in motion *processes* that, over the long term, enhance the quality and quantity of information that can better manage risks.

B. An International Emissions Market

Emissions markets require two basic categories of information: the actual quantities of net greenhouse gas *emissions* and the holdings of emissions *allowances*. At the end of the trading period, companies and governments must hold allowances that meet or exceed actual emissions. (See Box 1.) Ensuring that this information is accurate—at both the international and domestic levels—further requires the use of standard methodologies and measurement units so that a ton of carbon reported from one country is the same as a ton of carbon measured from another. This information will facilitate the determination of whether coun-

tries (and companies) are complying with their emissions limits. If delivered in a timely and accurate manner, this information will also help market participants

determine whether sellers are creditworthy (i.e., likely to comply and deliver the promised allowances).

Under the Kyoto Protocol, governments have a good start on these information

systems.¹⁷ On the emissions side, the Protocol requires each of the industrialized countries to have in place by 2007, a *national system* that estimates the net greenhouse gas emissions within its jurisdiction.¹⁸ It also requires these same countries to *report* greenhouse gas inventories and other important information regularly to the international authorities.¹⁹ In addition, it authorizes independent *expert review teams* to thoroughly assess all aspects of a country’s implementation of the Protocol, including inventory reports and the national systems through which they are prepared.²⁰ Reporting guidelines under the U.N. Climate Convention, as well as the Intergovernmental Panel on Climate Change (IPCC) standards provide further solid ground from which to proceed. Countries have agreed to implement IPCC “good practice” guidelines—such as identifying key source categories, systematizing uncertainty estimates, and adopting rules to formalize quality control and assurance programs.

On the allowance side, the Protocol envisions publicly accessible “national registries” to track who owns and transfers allowances. These registries will be standardized electronic databases containing “common data elements.” For instance, every participating country will have its own identifying code and national account. Private sector entities, when authorized by their governments, must hold accounts within the national registry as well. All allowances will be tagged with unique serial numbers, and can be located in only one national registry at any given time. These accounting systems will form the basis for determining whether a country is complying with their emissions obligations. Countries have already achieved substantial agreement on the structure of the registries.²¹

International standards and codes set in motion processes that, over the long term, enhance the quality and quantity of information that can better manage risks.



Despite this progress in building sound information systems, much work remains. In the coming years, Protocol Parties will need to more fully elaborate on this basic regulatory framework. The framework would benefit from a counterpart to the Basle Accords—a set of Climate Core Principles that articulates fundamental requirements for effectively managing the risks related to emissions trading. The Principles would set out the basics on how to monitor, report, and review the flows of physical emissions and emissions allowances at both the national and international levels.

They would delineate the duties of, and relationships among, private entities (including accounting and auditing firms), domestic authorities, and international regulators, spelling out guidelines for ensuring that information reviews are impartial.

Although progress on transparency codes and standards is vital, risk management principles also suggest a larger problem in the context of an international emissions market. Even with sound information systems and standards, it is not clear whether market participants will be able to gauge the creditworthiness of emissions allowance sellers. Even worse, the available information could even lead market participants astray.

In an international emissions market, determining the creditworthiness of a seller depends on assessing a government's *intentions* and *capabilities*. If governments egregiously oversell their allowances (or over emit), then they are not creditworthy. Likewise, even companies that are acting in good faith are not creditworthy, if they reside in a country whose government is not going to comply with its international obligations. Similarly, a government could intend to comply, but lack the capacity to do so. Given the limited ability of many governments to regulate their private sector and enforce laws, it would not be a stretch to imagine some governments establishing domestic emissions trading systems, yet ultimately failing to ensure that the domestic emitters stayed within their limits. And by 2012, governments, political systems, and even national borders may have changed dramatically. Given this situation, the nature and pervasive-

ness of uncertainty cannot be corrected through increased information flows alone.

“Informational asymmetries” are inherent in all financial markets. But given the above factors, they are particularly profound here. One way to reduce them is for

In an international emissions market, determining the creditworthiness of a seller depends on assessing a government's intentions and capabilities.

participating governments to reduce “regulatory asymmetries” by imposing substantially similar requirements. Here, governments would agree on mandatory guidelines for some aspects of domestic emissions trading programs, such as allowance

denominations and registry functions. Among countries adhering to the guidelines, there could be *mutual recognition* of each other's allowances.²² Allowances originating from countries that do not adhere to such guidelines might not be recognized under the domestic trading systems of some countries. The existing domestic experiences of leading countries, such as the United Kingdom, should help inform negotiations toward mandatory international standards.

Although standards may be needed to achieve market discipline, it is much less clear whether they are sufficient. Given the absence of timely, reliable, and standardized information, other means may be required to appropriately divide risks between buyers and sellers and properly align incentives so the risk-taker is also the risk-bearer. (This subject will be discussed in detail in Section IV.)

Finally, well intentioned disclosure requirements can backfire, and even increase risks, if they are not prudently conceived. For example, traders should not be required to disclose price information on allowance trades in their national registry accounts. Although such a requirement gives the illusion of providing more information, it would probably shift many transactions off-registry (where prices may not be reported) into forward, futures, and options markets. While such “derivative” markets provide important hedging and liquidity functions, they do not need any additional stimulants from ill-conceived regulatory requirements



that re-route transactions away from the registry-linked spot market.

Pushing transactions away from the spot market may result in an overall riskier emissions trading system because whatever information they may hold—such as price, quantity of allowances, who is trading, and the country source—vanishes or is extremely time-consuming to track down in derivative markets. In such instances, regulators, market participants, and general publics will have notably less confidence that the registry balances will accurately reflect the real assets and liabilities of governments and their firms.²³ Under the U.S. Acid Rain Program, brokers and exchanges disseminate price data, while customer anonymity is maintained. The same could work for international climate markets.

Regulatory framers must consider many factors when deciding what information to demand. These factors include the following: whether the information can be easily understood and interpreted by the market; is meaningful for assessing and managing risk; is burdensome to collect; raises proprietary and market competitiveness concerns; and is available from alternative sources (such as brokers). If an emissions market is going to be durable, the approach must also be flexible enough to respond to changing risk management needs as the market matures.²⁴ Thus, governments should periodically review and, as needed, revise regulatory standards.

III. THE NEED TO APPROPRIATELY SEQUENCE REGULATIONS

A market for stocks was born before the mechanisms for registering stocks and efficiently settling transactions were properly in place, and long before the enterprises whose stocks were traded started to behave like companies. A culture of lawbreaking became ingrained long before the appropriate laws and regulations could be enacted.

George Soros, on Russia²⁵

Well intentioned disclosure rules can backfire, and even increase risks, if they are not prudently conceived. For example, traders should not have to disclose prices for allowance trades.

A. Principle in Practice

Information disclosure and regulatory standards alone cannot sufficiently cope with risk. Timing is another important factor. Financial liberalization urges a two-step policy sequencing: (1) upgrading the financial framework's regulatory and supervisory systems, and *only then*, (2) opening the borders to international capital flows.

The Asian crisis illustrates how *not* to implement this second principle. During the late 1980s and early 1990s, several Asian “emerging” economies liberalized their capital accounts. They allowed international capital to come and go as investors chose. From 1994 through 1996, international banks invested about \$264 billion in the 25 emerging markets, pumping in \$120 billion in 1996 alone.²⁶

None of the Asian crisis countries, however, had adequate domestic regulatory and supervisory standards that could keep track of large-scale capital flows.²⁷ For example, they lacked the disclosure and transparency provisions within regulatory structures, discussed in Section II. International banks and others lent capital for short periods, such as a year. If the economic and credit outlook appeared adequate, the banks would “roll over” the debt as it became due.²⁸ The financial cycle ended in a series of panics from mid-1997 through 1998. Foreign bank lending in five Asian economies went from a \$47.8 billion *inflow* in 1996 to \$29.9 billion *outflow* in 1997—a turnaround of almost \$80 billion.²⁹ The international banks took their money out as they first lost confidence in the ability of Thailand and then other Asian governments to repay their short-term loans. The crisis escalated as depreciating currencies made loans even more difficult to repay. Financial collapse followed soon after.

The Asian crisis illustrates the need to sequence policies that upgrade the monitoring and supervisory standards vis-à-vis those that open the border to international capital flows. Regulators now recognize the need for such sequencing. In revising the Basle Core Principles, a standing committee³⁰ is even considering placing conditions on borrowing governments, such as subscribing to IMF



data dissemination standards³¹ and agreeing to exchange regulatory information.³² Such prerequisites would be a means of forcing some degree of policy sequencing on governments.

“Liberalization is inexpensive, fast, and easy to implement; building institutional capacity is expensive, slow, and complex.”

unfettered right to trade (regardless of their adherence to market rules) fails to provide an incentive for governments to comply with their international obligations, thereby jeopardizing the environmental goals sought by governments and advocates.

Policy sequencing is unfortunately not as simple as just taking step 1 before step 2. Liberalizing countries (as well as international regulators) must also have the *capacities* to implement effectively rules and guidelines. Do banks have the tools to manage complex financial risks? Do national oversight agencies have professional staff with a “high degree of political independence from political authorities and whose positions are well enough remunerated to be able to attract highly competent individuals to the job”?³³ The unfortunate reality “in all too many countries is that banks have a limited capacity to manage risk and that regulators have limited capacity to supervise their actions.”³⁴ These capacity constraints are particularly acute in so-called emerging markets, whose regulatory standards and capacity may or may not be “emerging” as fast as the country is entering global markets.

The practical difficulties of policy sequencing should not be surprising. As Stijn Claessens and Thomas Glaessner explain:

“Liberalization is inexpensive, fast, and easy to implement; building institutional capacity is expensive, slow, and complex. Thus many countries have done the quick and easy reforms first. However justified this sequence may be on political grounds, . . . it undermines the stability of the financial system.”³⁵

B. An International Emissions Market

For an emissions market, appropriately sequencing policies means that prudent oversight regulations for monitoring, reporting, and review must be implemented *before* opening the floodgates of international emissions trading. In practice, this sequencing can be secured by allowing countries to participate in trading markets only *after* passing an initial eligibility screening, where countries demonstrate minimum standards for accountability and capacity. Initial eligibility rules remain the subject of ongoing debate.³⁶ Allowing countries the

The Kyoto Protocol framework already includes some policy sequencing. It requires countries to have a reliable national inventory-estimation system in place no later than January 1, 2007.³⁷ Authorized international emissions trading starts in 2008. Although an important start, this sequencing is incomplete for two main reasons. First, the Protocol lacks a review procedure to assess the inventory-estimation requirement. Thus, there is no way to determine whether a country has, in fact, met the requirement. Second, the Protocol lacks the critical link between such a review and an initial eligibility requirement, which would determine whether a country can participate in international emissions trading. This shortcoming is exacerbated by the time-consuming nature of the Kyoto requirements, which are not easily amenable to prudent policy sequencing. (See Box 4.) This timing problem also underscores the difficulty of delivering timely and reliable information to the emissions market participants.

Even if a review procedure were in place to determine eligibility, two substantive concerns surface. Though discussed generally in Section II, policymakers must construct meaningful and effective international *rules*. In practice, whether an initial eligibility requirement is even worthwhile depends almost entirely upon the nature of such standards. Requirements that are too weak or too strong may result in the cure being worse than the disease.

In addition to appropriate rules, Parties must possess the *capacities* necessary to implement the Protocol’s regulatory system to participate in international trading. Well-crafted treaty provisions and domestic statutes are useless without the resources and abilities to implement them. As with other financial markets, this will be a difficult challenge. Initiating international



emissions transactions is relatively “inexpensive, fast, and easy to implement,” whereas building national capacity is considerably more “expensive, slow, and complex.”³⁸ Like financial regulation, capacity deficits are particularly acute in transitioning economies.

Governments, corporations, and official expert review teams will need professionals versed in climate-related aspects of accounting, auditing, regulation, and risk management. They will need training and competitive salaries. Both corporations and governments will need the resources necessary to access timely and accurate information on net emissions, registry holdings, and performance targets, including equipment and administrative support.³⁹ The tasks of building regulatory infrastructure and institutional capacity is particularly daunting in the context of Kyoto’s fast approaching first commitment period (2008-12). Given the poten-

tial benefits of international emissions trading, these challenges should motivate policymakers to build capacities and adopt rules that properly manage financial risks. For this, there will also be a substantial price tag, both nationally and internationally, that will need to be borne by industrialized countries.

Mindful that policy sequencing must combine strong rules with adequate capabilities, we introduce a Climate Trading Readiness Index (*see Table 1*). The purpose of this scale is to evaluate the preparedness of a country to engage in international emissions trading. Such an index can form the basis of initial eligibility requirements, as well as serve as a scorecard for market participants and observers to evaluate the readiness of countries. This prioritizing and prompting could help countries adhere to the minimum standards *before* engaging in trading.⁴⁰

Box 4

Kyoto Protocol Policy Sequencing: So Much To Do, So Little Time

The Protocol should require that, *prior to* engaging in international emissions trading, countries adhere to international minimum standards for monitoring and reporting domestic emissions.¹ However, this presents some practical difficulties, given the Kyoto time frames. According to the Climate Secretariat, the process of measuring, reporting, and verifying a country’s emissions could take as long as 38 months.² This would mean that a ruling on 2008 inventory data might not be made until February 2012. So, an eligibility decision stemming from the commitment period’s first year (2008) would not be known until the period’s last year (2012). As a result, the accurate and timely information needed to ensure investor confidence and environmental integrity will have vanished. This suggests that decisions on eligibility *during the commitment period* will need to be expedited in order to reduce the time-lag between actual emissions and their verification. The Parties should preestablish automatic triggers to reduce these time lags (e.g.,

eligibility is suspended, if a country fails to report at all).

The time lag has serious implications for a *precommitment period* review. As mentioned, the Protocol does not require “national systems” to be in place until the beginning of 2007. If all 38 industrialized countries waited until this date, it would likely be impossible for assessments (and possible appeals) to be completed prior to 2008. This suggests that the full suite of eligibility requirements should be in place before the date mentioned in the Protocol, to allow for review of all criteria. Parties should consider a deadline of 2005, instead of 2007. This could be accommodated by existing Protocol language.³

Generally, participation in international emissions trading should be a *conditional* right (as opposed to an absolute entitlement). In principle, countries should be required to pass a precommitment period review that is legally binding. In practice, however, a country should be assumed to be eligible *unless there is a finding of non-*

compliance during the precommitment eligibility screening. This guards against the possibility that a bottleneck in the review process (for which a country has no control) penalizes that country without any evidence of wrongdoing.

However, the precommitment review process itself must be mandatory and binding.

- 1 International standards are required for reviewing the reported data on national emissions and registries as well.
- 2 Lavanya Rajamani and Juliette Voinov, “Summary of the Workshop on Compliance under the Kyoto Protocol: 1-3 March 2000,” *Earth Negotiations Bulletin*, Vol. 12 No. 124, (March 6, 2000), pp. 2-10.
- 3 Expert review teams (under Article 8.1) are authorized to review national communications, including inventories and “necessary supplemental information” submitted by Parties, even before the commitment period begins (*see Articles 8.1, 7.2 and 7.3*). Thus, it would be possible to undertake a precommitment period review by 2005, provided that the Kyoto Protocol entered into force by that date.



Table 1

Climate Trading Readiness Index

Level	Description
5	The national system of estimating greenhouse gas emissions inventories has in place a complete set of prudent monitoring and reporting standards (e.g., consistent with IPCC good practice guidelines, such as identifying key source categories, systematizing uncertainty estimates, and adopting quality control-assurance systems). The national registry is set up according to international norms (country codes, serialized allowances, and public access features). The country has adequate institutional capacity (e.g., qualified staff, technical training and equipment) to conduct the inventory- and registry-related functions (including internal audits) but also to assist Expert Review Teams and other accredited international bodies in ensuring national accountability for obligations under a binding international climate agreement.
4	The country has established the above-mentioned systems of regulation and oversight, but the policy has not been entirely implemented.
3	The regulatory standards for estimating inventories and tracking allowances are underway but fall well short of functional. Also, national capacity is taking shape but remains inadequate.
2	The country has in place a minimal framework of regulations or capacities to monitor and report on flows of greenhouse gas emissions and allowances.
1	There are few, if any, prudent regulatory standards or capacity norms in place.

Source: Adapted from John Williamson and Molly Mahar, *A Survey of Financial Liberalization: Essays in International Finance* No. 211 (Princeton: Princeton University Press, 1998), pp. 59-60.

IV. THE KINGPIN OF RISK MANAGEMENT: PREVENTING PERVERSE INCENTIVES

Very early in the game providers of fire insurance, in particular, noticed that property owners who were fully insured against loss had an interesting tendency to have destructive fires—particularly when changing conditions had reduced the probable market value of their building to less than the insurance coverage. . . . Eventually [moral hazard] came to refer to any situation in which one person makes the decision about how much risk to take, while someone else bears the cost if things go badly. . . . heads I win, tails you lose.

Paul Krugman, on moral hazard⁴¹

A. Principle in Practice

Perverse incentives, which encourage excessive and reckless risk taking, can bring ruin to financial markets. To guard against this, regulatory frameworks aim to promote market discipline, whereby investors receive returns on good investments and suffer losses on bad ones. In other words, there is a clear relationship between

risks and rewards. To do this, the system must address who has legal “liability” in the event that one party defaults on contractual obligations to another party. A rule apportioning liability between buyers (lenders) and sellers (borrowers) must be formulated before transactions take place. Otherwise, the underlying financial value of the transaction would be highly uncertain which, in turn, would devastate confidence.

As mentioned in Section II, financial markets typically operate under buyer-beware liability rules, which gives lenders a powerful incentive to check the creditworthiness of borrowers and their underlying assets. In many Asian countries hit by the 1997-98 financial debacle, however, governments were using banks to finance their domestic industrial programs. In exchange, governments gave banks loan guarantees; some banks even became “quasi-fiscal” agents of government.⁴² Coupled with previous bailouts, these relationships gave domestic and international lenders little reason to insist on creditworthy borrowers. After all, lenders would likely get their money back regardless of



how loans performed, diluting incentives to exercise prudence. Regulators had effectively decoupled risk from return. Soon after the crisis hit, the Thai, South Korean, and Indonesian authorities announced further broad guarantees for bank depositors and creditors. And Thailand, Indonesia, South Korea, Russia, and Brazil received international rescue packages totaling about \$190 billion.⁴³

The Asian crisis pummeled many investors and firms in the stock and bond markets. Nevertheless, these kinds of guarantees and bailouts permitted some investors—especially international banks—to emerge relatively unscathed from bad lending decisions. As with previous financial fiascoes, such as the 1995 Mexican peso crisis,⁴⁴ liability of buyer-beware for many bank loans was a fiction: given the perverse incentives, recklessness paid.

B. An International Emissions Market

More than any other principle, preventing perverse incentives is crucial to an international emissions market. If the incentives are perverse, all the transparently disclosed information in the world cannot prevent an environmental train wreck. And the most important tool for conforming to this principle is the liability rule: *who* is liable when a seller breaches or defaults on its obligation by transferring an allowance that it needs to comply with its emissions target? Selecting a liability rule is a major point of disagreement among countries in the international climate negotiations. This rather complicated and legalistic subject has risen to the highest level of political importance in the climate talks. Countries have proposed numerous options for doling out liability amongst buying and selling Parties.⁴⁵

Why is liability so important? Because, if buyers or sellers lack incentives to act in good faith and are rewarded for excessive risk taking, cost-effectiveness will be jeopardized and widespread noncompliance with emissions targets will be likely. If countries flout their international emissions obligations, there simply is no durable emissions market. And as noted earlier, inter-

national law lacks the effective “big stick” to use sanctions and fines that ensure countries adhere to their commitments. *Therefore, the liability rule must promote treaty compliance*, which is best done by placing burdens on the actor(s) most able to do something about compliance.

More than any other principle, preventing perverse incentives is crucial to an international emissions market.

A full comparison of existing proposals is beyond the scope of this paper.⁴⁶ To give this subject its due importance, however, we will evaluate how several approaches stack up with respect to risk management.

The different proposals reflect

the political concerns that particular countries have about specific risks. On balance, countries prioritize threats differently, selecting one or two they care most about. Overall, governments have demonstrated at least five major concerns, which amount to potential “deal breakers.” (See Box 5.) A successful liability rule will likely have to balance these concerns. In our view, the existing proposals reviewed below each fail to do this. Thus, we propose a potentially promising alternative.

i. Risk and Liability Rules

The first “liability option” for an international emissions market is usually termed “buyer-liability.”⁴⁷ Here, if selling Parties are found to be in noncompliance, allowances already sold may be invalidated and repatriated back to the original sellers.⁴⁸ Thus, buyers must “beware” with respect to the quality of the emissions allowances being purchased, since they are not guaranteed. Sellers will be penalized through lower market prices, *unless* they send strong market signals that they are acting in good faith and have the capabilities to implement an adequate regulatory framework. Thus, the market will heavily discount (perhaps to zero) the price of allowances from sellers that are obviously acting in bad faith.

Although buyer-beware is the default liability rule in almost all financial markets, there is reason to believe that this approach will not effectively manage risks in international emissions trading. One of the main reasons, touched on in Section II, is the inability to gauge a seller’s intentions and, therefore, creditworthiness. Transparency can-



Five potential deal breakers are described below. A liability rule for an international emissions market must address and balance these different concerns. Although negotiators may rightly view the deal breakers in terms of the political interests and regulatory needs of various governments, they are risk management issues as well.

i. Intentional Overselling. Governments intentionally oversell their emissions allowances. Because the seller has no intention of complying, this behavior is often referred to as “rogue trading.” Rogue traders could be a government or a private sector company. Such behavior would certainly result in a loss of environmental integrity. This contrasts to *marginal*, or inadvertent, overselling, which might not sacrifice environmental goals and might be inevitable in some cases.

ii. Market Power. A single actor (or coordinated set of actors, such as a cartel) intentionally manipulates market prices or prevents others from entering into the market. For international

emissions trading, market power risks could be particularly acute, since there are few dominant sellers, which makes collusion easier, and a dominant buyer. *Liquidity risks* typically run parallel to market power risks and exist when market participants cannot buy or sell allowances easily, or at reasonable prices.

iii. Cascading Defaults. The noncompliance of one country automatically triggers the noncompliance of one or more other countries, because allowances have been invalidated. This risk is confined to liability proposals that include a buyer-liability rule.

iv. Incompatibility with Domestic Emissions Trading Systems. Here, the rules for international emissions trading are unfriendly to domestic emissions trading systems. This risk is confined to liability proposals that include a buyer-liability rule as well. In the case of the Kyoto framework, buyer-beware allowances would create uncertainty over whether an allowance is valid until as late as 2015, making it almost impossible to have annual or biannual compliance periods domestically.

v. Inadequate Cash Flow to Economies In Transition. Some transition countries, such as Russia, demand prompt receipt of revenues from emissions trading. Emissions in these countries are substantially below historical levels. Early allowance sales in these cash-deprived countries could facilitate the deployment of carbon-efficient technologies.

The failure to heed several of these concerns could, at worst, lead to widespread treaty noncompliance or, at best, needlessly elevate compliance costs. To the extent that any of these issues reduce the cost-effectiveness of emissions trading, they will also put pressure on noncompliance, because governments are less likely to comply with more costly commitments. A critical point, relating to all of these issues, is that *perception* matters. The mere appearance that emissions markets could be plagued by market manipulation, for example, may be enough to damage confidence in the market and, consequently, reduce the system’s cost-effectiveness and compliance incentives.

not solve this problem. Thus, search costs for buyers will be high and based on questionable information. In addition, under a buyer-liability rule, one country’s noncompliance could set off a domino effect, leading to widespread noncompliance, as allowances are successively repatriated back to those in noncompliance (i.e., cascading defaults). Even more troubling, the time-consuming process of assessing international compliance (discussed in Section III) would add uncertainty to national policies, since market participants and domestic regulators would not know whether an allowance is valid until as late as 2015.

A second, and more promising, liability option for an international emissions market is usually dubbed “seller-liability.”⁴⁹ Here, if a country sells too many emissions allowances, it is subject only to whatever consequences Protocol Parties agree to for noncomplying countries.

These penalties will most likely be weak, if history is any guide (making “seller-liability” an oddly inappropriate name). The buyer, on the other hand, is able to use the allowances toward its Protocol obligations, *regardless of seller nonperformance*. Each allowance is “good as gold” for the buyer. There are many merits to this approach, including insignificant search costs for buyers, sufficient liquidity, and friendliness to domestic emissions trading systems.

But the Achilles heel of seller-liability is its inability to guard against intentional government overselling, because the market cannot discount allowances of dubious quality. Given that sellers benefit regardless of their performance, moral hazard is possible. Of the “deal breakers” described in Box 5, intentional overselling (i.e., rogue trading) could most seriously damage the environmental

integrity and cost-effectiveness of the treaty, because it could result most readily in systemic failure or catastrophic loss.⁵⁰ *Intentional* overselling differs from *marginal* overselling, which could be inevitable and have little effect on market confidence. The difference centers on *intent*: whether countries are acting in good faith or bad faith, a factor notoriously hard to discern.

The mere perception that one or two countries could manipulate the market may be sufficient to damage market confidence.

Recognizing the advantages and disadvantages of each approach, governments and observers have devised a promising third approach to liability, termed the “nontradable reserve.” Here, each country would have a reserve account containing allowances that could *not* be traded. The remainder of the allowances would be tradable on a seller-liability basis.

This approach is sensible because not all allowance sales are equally risky. As Figure 2 illustrates, countries will generally need to retain most of their allowances to cover their actual emissions. Therefore, the more allowances a

country sells, the higher the risk of noncompliance. The nontradable reserve addresses this situation by distinguishing between *high* and *low* risk allowances, and then applying a different rule to each segment according to riskiness. High risk allowances are designated as nontradable and contained in a reserve account, thereby guarding against massive government overselling.

The effectiveness of this third approach depends critically on the size of each country’s nontradable reserve. There are generally two options for determining the reserve amount: (1) an agreed upon percentage of total allowances, or (2) an agreed upon percentage of projected future emissions (determined impartially), whichever is the lowest.⁵¹ The second option permits some countries that are already well below their Kyoto targets—such as Russia, Ukraine and other economies in transition—to sell their extra low risk allowances. For both options, agreeing on the percentage is the tricky part, and proposals at the November 2000 climate talks in The Hague ranged widely—from 60 to 100 percent reserve requirements.

Although appealing in principle, imprudently set reserve requirements could damage emissions markets. Specifically, there are potentially dangerous trade-offs between a high and low reserve requirement. A low reserve requirement, say 60 percent, would not sufficiently guard against overselling, a major concern of many countries, especially since some countries would use option 2 above, which would permit more selling.⁵²

A high reserve requirement, on the other hand, would prevent overselling. In the context of the Kyoto targets, however, a high reserve requirement could introduce a host of new problems. These difficulties include increased potential for illiquidity and market manipulation. Table 2 shows how different reserve requirements result in varying allocations of internationally tradable allowances. A 95 percent reserve requirement, for example, would put 73 percent of the marketable allowances in the hands of a few transition economies,

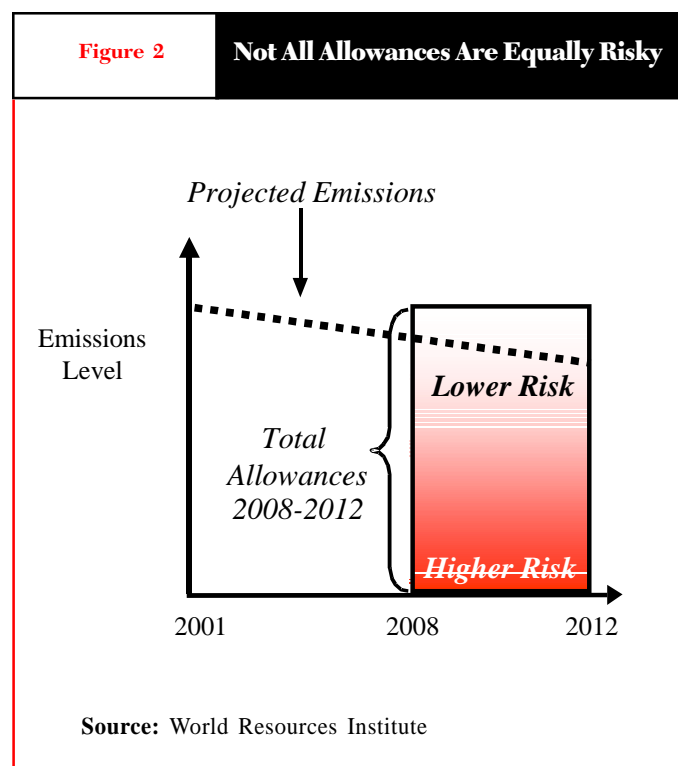


Table 2

Nontradable Reserve Requirements: When Does Market Power Emerge?

Percentage of the Total Amount of Internationally Tradable Emissions Allowances

	Reserve Requirement (percentage of total allowances)				Required Reductions (2008-12)
	80	90	95	100	
Economies in Transition*	48	61	73	100	-1,535
United States	26	20	13	0	2,791
European Union**	18	13	9	0	922
Japan	5	4	3	0	386
Rest of Annex I Countries***	3	2	2	0	635

Source: World Resources Institute, based on data and reference case projections from the U.S. Department of Energy, Energy Information Administration, *International Energy Annual 1999* and *International Energy Outlook 2001*.

Notes: Percentages calculated based on the two methods, described in the text, of determining reserve amounts. Percentages may change depending on the supply of credits available from Clean Development Mechanism projects and the associated rules for international transfer of those credits. See discussion below. “Required Reductions” are measured in tons of carbon. “Annex I” countries refer to industrialized countries.

* Includes the Russian Federation, Ukraine, and nine Central and Eastern European Countries.

** Includes Norway and Switzerland.

*** Includes Australia, Canada, and New Zealand.

mainly Russia and Ukraine.⁵³ Bad idea. While there are obvious differences between emissions markets and petroleum markets, the 11 members of the Organization of Petroleum Exporting Countries (OPEC) exert substantial influence over market prices in the world oil market with typically less than a 50 percent market share.

Market power problems may actually be more acute than the numbers in Table 2 suggest. Although the United States, the European Union, and Japan are likely to have some internationally tradable allowances, Table 2 suggests that they will need these allowances, and additional ones, to demonstrate compliance by the end of the commitment period. In addition, the mere *perception* that one or two countries could manipulate the market may be sufficient to damage market confidence. Neither appearance nor reality instills appreciable confidence while, for example, some captains of Russian industry blur traditional boundaries between public (state) power and private (corporate) gain.⁵⁴

ii. Escrow Reserve

As discussed above, a nontradable reserve manages risks well, with one notable complication: there is a seemingly unresolvable tension between a high and low reserve requirement. Our proposal—the *escrow reserve*—builds on the strengths of a nontradable reserve approach, while attempting to remedy its shortcoming through a simple, yet consequential, modification. Instead of making reserve allowances nontradable, our proposal allows them to be transferred under conditions, whereby the initial seller does not receive payment *until demonstrating compliance*. How is this done? Higher risk allowances, contained in the reserve account, are transferred only through an escrow system.⁵⁵ An escrow is a legal instrument commonly used by financial institutions. (See Box 6.) The revenue from the sale remains in escrow until the seller demonstrates compliance. The escrow reserve would address the tension found in the nontradable reserve proposal between setting a high reserve requirement (good for preventing overselling) and a low reserve requirement (good for avoiding market manipulation). The reserve require-



An *escrow* is a legal instrument in which two entities agree to put a sum of money in the hands of a third party for its conditional delivery under explicit conditions. Thus, an escrow typically involves money (e.g., securities or other financial assets), a contingent act (e.g., termed “specific performance”), and three parties—a buyer, a seller, and an intermediary called a custodian or agent. The buyer demonstrates a good faith purchase by giving all or a portion of the purchase price to the custodian,

who must safeguard the funds until the agreed on *specific performance* has occurred, at which time the custodian releases the funds to the seller. The escrow’s instructions legally bind the custodian. The buyer can receive the initial funds back *only* if the seller fails to comply with contract terms.

An escrow *account* refers to an escrow in which the custodian is authorized to invest the funds in interest-bearing securities to receive the benefits of compounded

interest at market rates. Whether interest-bearing or not, escrows embody a practical, inexpensive, and time-tested financial vehicle, which is used everyday to facilitate commercial transactions, most notably in real estate.

Sources: *Black’s Law Dictionary*, Bryan A. Garner, (St. Paul: West Publishing Co., 1999), p. 565; *Encyclopedia of Banking and Finance*, Glenn G. Munn, (Rolling Meadows, Ill.: Bankers Pub. Co., 1991), p. 298. *Dictionary of Banking and Financial Services*, Jerry M. Rosenberg, (New York: Wiley, 1985), p. 264.

ment could be set relatively high, say 95-98 percent, and deal capably with both the overselling *and* market power risks.

From the buyer perspective, the escrow element is invisible. This proposal looks identical to pure seller-liability, described above. All allowance purchases are riskless. From the seller perspective, some allowances (say, 5 percent, or a higher number determined from projections) will be available for regular seller-liability. Here, payment from sales is immediate. For sales of the higher risk reserve allowances, payment will be placed in an escrow account and will earn an appropriate market interest rate, until compliance is demonstrated.

The main advantage of an escrow reserve is that it provides a virtual assurance against illiquidity and active market manipulation in international emissions trading, while at the same time promoting compliance with emissions targets. The escrow reserve elicits a dynamic behavioral effect. That is, regardless of whether the escrow reserve is ever tapped, its *presence* sends a powerful signal to market participants not to attempt price manipulation. This is so because the vastly greater supply of transferable allowances available under escrow (relative to a nontradable reserve) may substantially dilute pricing power.

The need for an escrow reserve will depend on other market factors that influence allowance liquidity. For example, the presence of a robust Clean Development

Mechanism may provide large quantities of additional allowances, dampening the potential for price manipulation. Others have proposed using a “price cap” within the international emissions trading market, whereby an unlimited quantity of allowances is available for sale at a given price. This would frustrate any attempt by market actors to drive up prices higher than the price cap, thereby obviating the need for an escrow reserve.

On the other hand, other factors may increase the need for an escrow transfer system. For example, if countries adopt little or no consequences for noncompliance, the trading system itself will carry a stronger burden of providing market incentives for compliance. Sales from an escrow reserve promote compliance because the seller does not receive payment until compliance is demonstrated. Furthermore, if overselling countries do not comply, any funds held in escrow would be channeled toward greenhouse gas mitigation activities, such as through a fund investing in Clean Development Mechanism projects. Thus, although liability proposals (which *are* addressed in this section) are clearly distinct from non-compliance proposals (*not* addressed in this *Note*), this particular liability rule does provide partial or even over-remediating of the environmental consequences of non-compliance.

iii. Other Considerations

Irrespective of market conditions, an escrow reserve raises some additional issues that merit discussion. An obviously unpopular feature of the proposal is that sellers of escrow



allowances may not receive payment for years after the transaction takes place (especially if compliance is not verified until as late as 2015). Although there is no question that this is a shortcoming, it is not as bad as it sounds.

First, our proposal still permits low risk allowances (in which payments are received immediately) to be sold through normal seller-liability. Thus, cash strapped countries (with low current emissions compared to historical emissions) will receive needed cash flows. Most countries are not likely to be in a position, under any liability rule, to sell additional high risk allowances.⁵⁶ However, to guard against market power and liquidity risks, it is vital that countries at least have the *option* of putting these allowances on the market.

Second, while being held in escrow, payments from emissions trades will earn interest at appropriate market rates. This is a normal feature of escrow accounts. Third, companies and their countries can reduce cash flow problems, at least to some degree, by borrowing on accumulating escrow funds from financial intermediaries. In other words, this illiquid asset can be used as collateral to borrow funds from financial intermediaries that will discount the full value of the funds held in escrow. Fourth, for sales of escrow allowances, only the revenues from the *initial* international transaction are held in escrow. Subsequent international sales of these allowances are treated exactly like low risk allowances.

Another drawback of the escrow reserve is the added administrative system costs. Brokers and exchanges will need to ensure that revenues are placed in escrow for allowances sold from reserve accounts. This would require each allowance to be tagged in a way that reveals whether or not the allowance is from the reserve account. Still, electronic-based tagging is not unique to the escrow reserve proposal. Moreover, it would perhaps only need limited, low-cost information, such as a demarcating symbol and two more bank account numbers. Finally, routing all escrow allowance trades through brokers also neutralizes any incentive for buyer and seller to cheat by making side payments and placing little or no funds in escrow. With adequate, enforceable penalties in cases of aiding a breach, brokers can cost-effectively stymie any fraud of escrow funding.

V. SUMMARY AND RECOMMENDATIONS

An international market for greenhouse gas emissions promises both rewards and risks. Given the wide differences among countries on the costs of reducing emissions, the rewards stem from the opportunity to drastically reduce overall compliance costs. If successful, emissions markets will create powerful price signals that, in turn, send equally powerful signals to capital markets, corporations, and governments. However, these much-heralded gains carry accompanying risks that jeopardize the international environmental policy experiment in ways large and small. Although receiving less attention, these risks must be well managed.

As noted, regulatory lessons from international and domestic emissions trading (e.g., the Montreal Protocol and the U.S. Acid Rain Program) have only limited value for risk management of a liberal international climate market. However, emissions allowances share traits with capital assets—where lessons on liberalizing international markets abound. Some time-tested, risk management principles from financial markets apply to international emissions trading as well. These principles will need to guide the design and implementation of a prudent regulatory framework that must underpin any liberal international emissions market. In practice, three principles must inform the rules that promote compliance.

A. Transparency Matters

Rules on transparency and disclosure must result in supplying timely and accurate information that market participants need to manage cost-effectiveness and compliance. Arm's length dealings instill confidence that trade prices are accurate as well. International standards on transparency and disclosure ensure that rules are clear and unambiguous and that data are reliable and comparable. Procedural clarity lowers transaction costs as standard practices make it easier to follow rules and manage the information flows. Parties should continue to build on the monitoring, reporting, and review provisions included in the Kyoto Protocol and the IPCC "good practices" on estimating national greenhouse gas inventories. In addition, the Parties should adopt a climate-related parallel to the Basle Core Principles that would set out the basic relationships among private entities (including accounting and auditing firms), domestic authorities, and international regulators, such as the expert review teams.



B. Policy Sequencing Matters

Having a sound regulatory framework that generates timely and accurate information is in itself insufficient. A system of regulatory supervision must be up and running before international allowance trading begins. Put differently, policies must be sequenced: regulatory framework first and then permission to engage in international emissions allowance transactions. Parties should:

- Require that all participating countries submit to legally binding initial eligibility requirements for international emissions trading. Parties that fail this review should be ineligible to participate in trading. In the Kyoto context, countries should be prepared for the initial eligibility screening by 2005. This deadline is feasible given existing treaty provisions.⁵⁷
- Adopt appropriate standards, such as those outlined in the Climate Trading Readiness Index, for evaluating whether countries are prepared to participate in international trading.
- Provide adequate financial and technical resources to both governments (particularly economies in transition) and international regulators (e.g., expert review teams) to ensure adequate implementation capacity.
- Adopt streamlined eligibility requirements applicable during the commitment period. For example, if a country fails to submit its inventories, trading rights should be withdrawn.

C. Perverse Incentives Matter

International emissions trading must maintain environmental integrity and cost-effectiveness by placing compliance burdens on the actor(s) most able to abide by the rules. The *ex ante* rule assigning liability for default or noncompliance risk is the place where avoiding moral hazard matters most. To minimize perverse incentives from international emissions trading, Parties should distinguish between high and low risk allowances in a manner that effectively manages a broad set of risks and political “deal breakers.” *Low* risk allowances (i.e., nonreserve) should be tradable on a seller liability basis. Initial international sales of the *high* risk allowances, on the other hand, should be brokered through an escrow system from a commitment period reserve account. This liability rule may be the key to keeping “deal-breakers” within politically acceptable boundaries.

Collectively, these recommendations on transparency, policy sequencing, and perverse incentives can form the basic elements of a prudent, liberal, regulatory framework for an international emissions market.

“Learning by doing” is a constant refrain of many proponents of international emissions trading. It is unquestionably good advice. The idea is to set up small-scale pilot activities and find out what works and how to fix what doesn’t. In this way, policymakers can learn about the likely effectiveness of the program at a larger scale. Although such experience is often the best teacher, another approach is to learn from the mistakes of others. Nascent international greenhouse gas emissions markets need not undergo the tumultuous times known from crises in more traditional financial markets. Indeed, in shaping specific rules, the time-tested lessons of financial risk-management principles offer an opportunity for “learning by *not* doing.”

ACKNOWLEDGMENTS

The authors wish to thank many WRI colleagues for their advice and assistance, including Matt Arnold, Duncan Austin, Hyacinth Billings, Navroz Dubash, Carollyne Hutter, Fran Irwin, Nancy Kete, Silvi Llosa, Crescencia Maurer, Daphne Perkaus, David Sandalow, and Janet Ranganathan. The authors are also grateful for comments and suggestions from Andrea Baranzini, Richard Baron, Jan Corfee Morlot, Kyle Danish, Nives Dolsak, Charles Eyre, Justin Mundy, Don Reed, Ranil Salgado, Richard Sandor, Susan Subak, and Farhana Yamin. The authors are responsible for any remaining errors and omissions.

The authors appreciate the generous financial support of the Helen Brach Foundation, Tom Hagerty, Paul Salem, Earl Segerdahl, and an anonymous donor.

ABOUT THE AUTHORS

James F. Perkaus is a Fellow and **Kevin A. Baumert** is an Associate in the Climate, Energy, and Pollution Program at the World Resources Institute.



NOTES

1. For example, the Brazilian Proposal and Contraction and Convergence would require international emissions trading to work. See Anil Agarwal, Sunita Narain, and Anju Sharma, *Green Politics* (New Delhi: Center for Science and Environment, 1999); and Aubrey Meyer, *Contraction and Convergence: The Global Solution to Climate Change* (Devon, UK: Green Books, 2000).
2. The Kyoto Protocol uses a *global warming potential* (GWP) for each of its six greenhouse gases, which are denominated in carbon dioxide equivalents.
3. Dan Dudek and Jonathan Wiener, *Joint Implementation, Transaction Costs, and Climate Change* (Paris: OECD, 1996), p. 30.
4. *Adverse* change is emphasized in this popular usage.
5. Exactly how liberal will be determined by international and domestic factors, such as how many countries will implement domestic emissions trading programs. In any case, the Kyoto Protocol will never be fully liberal. The key limitation is that the Kyoto Protocol is a treaty among sovereign states, which cannot be liberalized (i.e., devolved to the private sector). This means that States remain solely responsible for the treaty obligations, even if they use domestic legislation to motivate private actors to help meet their national commitments.
6. Arm's length refers to a legal standard under which unrelated parties (each acting in his or her own behalf) would carry out a particular transaction. *Black's Law Dictionary*, Bryan A. Garner, (St. Paul: West Publishing Co., 1999), p. 103. Arm's length transactions are the bedrock of competitive markets as participants have confidence that prices transmit important information about resource scarcity, which will affect consumption and investment decisions accordingly.
7. United Nations Framework Convention on Climate Change (UNFCCC), 1997. *The Kyoto Protocol* (Bonn, Germany: Climate Change Secretariat, 1997). See Articles 12 and 6, respectively. Available online at: <http://www.unfccc.de>.
8. Although the Asian financial crisis had many causes (some common to many countries, others not), only the three factors most pertinent to international emissions trading are explored. Even here, they are used simply to illustrate how liberal market principles are put into action for managing risk. The many other factors that unquestionably contributed to the Asian crisis—exchange rate regimes and currency speculation, among others—are beyond this paper's scope and, thus, are not discussed.
9. Louis D. Brandeis, *Other People's Money: And How the Bankers Use It*, (New York: Frederick A. Stokes Company, 1932) p. 92. Brandeis used the term *publicity*, rather than transparency.
10. Arthur Levitt, Chairman of the SEC. As cited in Floyd Norris, "S.E.C. Proposes Stricter Accounting Rules," *New York Times* (June 28, 2000), p. C1.
11. Somchai Richupan, "Macroeconomic instability and housing finance: Thailand's experience," *Housing Finance International*, Vol. 14, No. 2 (December 1999), pp. 26-35.
12. John Williamson and Molly Mahar, *A Survey of Financial Liberalization: Essays in International Finance* No. 211 (Princeton: Princeton University Press, 1998), p. 52.
13. "Standards and Codes," International Monetary Fund, information available online at: <http://www.imf.org/external/standards/index.htm> (June 10, 2001).
14. See Note 13. In addition, certain figures are more sensitive to time than others. So the informational content for some statistics become less useful and maybe useless over time. The IMF standards recognize this and require more frequent reporting for these areas. For information that is difficult or expensive to collect, the IMF allows more flexible reporting procedures. The "transparency reports" refer to the Reports on the Observance of Standards and Codes, with information available online at: <http://www.imf.org/external/npr/rosc/index.htm> (June 10, 2001).
15. See the *Core Principles for Effective Banking Supervision*, (Basle: Basle Committee on Banking Supervision, 1997). Available online at: <http://www.bis.org/publ/bcbs30a.htm> (June 14, 2001)
16. "Sweeter Basle" and "Stronger Foundations," *The Economist*, January 20-26, 2001: pp. 18-20, and 67-68. See also, IFCI Risk Institute, "Risk Mitigation Overview: Accounting and Disclosure," Available online at <http://risk.ifci.ch/134940.htm> (June 10, 2001).
17. The Kyoto Protocol's monitoring, reporting, and review functions for Annex I (industrialized) countries actually build on those contained in the Framework Convention on Climate Change (1992). These include submitting annual greenhouse gas inventories and periodic "national communications." See Jan Corfee Morlot, *Monitoring, Reporting And Review Of National Performance Under The Kyoto Protocol* (Paris: OECD, 1999), pp. 30-31.
18. Article 5, *The Kyoto Protocol*. (Note 7.)
19. Article 7, *The Kyoto Protocol*. (Note 7.) The reporting requirements in Article 7 are also based on Article 12 of the UNFCCC. Market trades are expected to be included in the "supplementary information" required to be submitted under Article 7.
20. Article 8, *The Kyoto Protocol*. (Note 7.)
21. See the negotiating text on registries at FCCC/CP/2000/CRP.4 (November 24, 2000), "Preparations for the First Session on the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol (Decision 8/CP.4). Work Program on Mechanisms. Registries: Note by the President."
22. For industrialized country candidates, which appear most likely to form plurilateral trading groups that could include mutual recognition pacts, see Richard Sandor, "As I see It," *Environmental Finance*, (March 2000): p. 11.



23. As used here, liabilities are like debts—namely, what an entity owes. It should not be confused with the buyer-, seller-, and hybrid-liability rules discussed in Section IV.
24. Adapted from IFCI Risk Institute, May 2000, “Risk Mitigation Overview: Accounting and Disclosure.” Available online at <http://newrisk.ifci.ch/134940.htm> (June 13, 2001).
25. George Soros, “Who Lost Russia?,” *The New York Review of Books*, (April 13, 2000): p. 12.
26. See Jeffrey Sachs and Andrew Warner, “Year in Review,” in *Global Competitiveness Report 1999*. World Economic Forum (Geneva: World Economic Forum, 1999), p. 18.
27. Israel and Peru are the only two developing countries who have substantially upgraded the regulatory and supervisory policies of their banking systems. Neither was much affected in the crisis of 1997-98. See Williamson and Mahar, 1998, p. 60. (Note 12.)
28. Martin Baily, Diana Farrell, and Susan Lund, “The Color of Hot Money,” *Foreign Affairs*, Vol. 79 No. 2, (March-April, 2000): pp. 99-110.
29. See Note 28. The five Asian crisis countries were Thailand, Malaysia, South Korea, Indonesia, and the Philippines.
30. The Basle Committee on Banking Supervision.
31. Basle Committee on Banking Supervision, *A New Capital Adequacy Framework*, (Basle: Basle Committee Publications, June 1999), p. 28. Available online at <http://www.bis.org/publ/bcb50.htm> (June 14, 2001).
32. IMF, *International Standards and Fund Surveillance—Progress and Issues*, Prepared by IMF staff, August 16, 1999. Available online at <http://www.imf.org/external/np/ros/stand.htm> (June 13, 2001).
33. Williamson and Mahar, p. 29. (Note 12.)
34. Barry Eichengreen, *Toward a New International Financial Architecture* (Washington, DC: International Institute for Economics, 1999), p. 12.
35. Stijn Claessens and Thomas Glaessner, *Are Financial Sector Weaknesses Undermining the East Asian Miracle?* (Washington, DC: World Bank, 1997), p. 8.
36. Many agree that an initial eligibility screening is a good idea. For a discussion capturing different sides of the debate, see Lavanya Rajamani and Juliette Voinov, “Summary of the Workshop on Compliance under the Kyoto Protocol: 1-3 March 2000,” *Earth Negotiations Bulletin*, Vol. 12 No. 124, (March 6, 2000), pp. 2-10.
37. Article 5.1, *The Kyoto Protocol*. (Note 7.)
38. Claessens and Glaessner. (Note 35.)
39. According to Jeffrey Garten, Dean of the Yale School of Management, “If the [Asian] crisis does anything, it should bring home to us the awesome amount of infrastructure that must now be built. For emerging markets this will mean a generation of training in financial regulation [and] supervision. . .” See Jeffrey Garten, “Lessons for the Next Financial Crisis,” *Foreign Affairs*, Vol. 78 No. 2, (March-April 1999): p. 86.
40. Other suggested criteria include ratifying the Protocol, agreeing to an international compliance regime, adding a condition on “demonstrable progress” by 2005, and establishing a domestic compliance system capable of enforcing the implementation of the Party’s protocol obligations.
41. Paul Krugman, *The Return of Depression Economics* (New York: W.W. Norton & Company, 1999), p. 66.
42. Morris Goldstein, *Asian Financial Crisis: Causes, Cures, and Systemic Implications* (Washington, DC: Institute for International Economics, 1998), p. 2.
43. “The Future of the International Financial Architecture,” Report of a Council on Foreign Relations Task Force, *Foreign Affairs* Vol. 78 No. 6, (November-December 1999), p. 177. As of November 1999, only 30 percent of those pledges had been disbursed.
44. Thus, bailouts from the 1995 Mexican peso crisis can be thought of as having helped set the stage for the boom and bust of the decade’s last half. See Eichengreen, pp. 59-61. (Note 34.)
45. UNFCCC, *Program on Mechanisms, Article 17*, (November 25, 2000), FCCC/CP/2000/CRP.3. At the conclusion of the session of the 6th Conference of the Parties in November 2000, liability remained among the few outstanding issues. It also formed a topic of discussion in December 2000 talks in Ottawa.
46. E. Haites and F. Missfeldt. 2001. “Liability Rules for International Trading of Greenhouse Gas Emissions Quotas.” *Climate Policy* 1(1). Richard Baron, *An Assessment of Liability Rules for International GHG Emissions Trading* (Paris: International Energy Agency Information Paper, October, 1999). Tim Hargrave, et al, *Defining Kyoto Protocol Non-compliance Procedures and Mechanisms*, (Washington, DC: Center for Clean Air Policy, Leiden International Emissions Trading Papers, October, 1999). Robert R. Nordhaus, Kyle W. Danish, Richard H. Rosenzweig, and Britt Speyer Fleming, “International Emissions Trading Rules as a Compliance Tool: What is Necessary, Effective and Workable?,” *Environmental Law Reporter*, Vol. 30, (October 2000). Erik Haites, *International Emissions Trading and Compliance with Greenhouse Gas Emissions Limitation Commitments*, Working Paper 70, (Geneva: International Academy of the Environment, 1998). Glenn Wiser and Don Goldberg, *Hybrid Liability Revisited: Bridging the Divide Between Seller and Buyer Liability* (Washington, DC: Center for International Environmental Law, November, 2000). Available online at <http://www.ciel.org/HybridLiabilityCOP6.pdf> (June 12, 2001); Dan Dudek, Joseph Goffman, Michael Oppenheimer, Annie Petsonk, and Sarah Wade, *The Path Forward: Cooperative Mechanisms Under the Kyoto Protocol*, (Washington, DC: Environmental Defense, June 1998). Available online at <http://www.environmentaldefense.org/pubs/Report/PathForward> (June 12, 2001); UNFCCC, *Work Program on Mechanisms, Article 17*, FCCC/CP/2000/CRP.3 (November 25, 2000).



47. More accurately, this approach is termed “user party” liability. Since an allowance could change hands between buyers and sellers many times, user-liability makes it clear that the liability is with the *final* owner, not previous buyers.
48. Repatriation could work a number of ways, including a *proportional discount* of all allowances sold or repatriating allowances in the reverse order of sales (i.e., based on the LIFO method of inventory accounting: Last-In, First-Out) until emissions excess is remedied, with the most recent sales being the first to be invalidated.
49. More accurately, this approach is termed “issuing party” liability. Since an allowance could change hands between buyers and sellers many times, issuer-liability makes it clear that the liability is with the *original* seller, not subsequent sellers.
50. While market power risk is often seen as threatening cost-effectiveness, it may jeopardize environmental integrity as well. This is true to the extent that higher compliance costs will, beyond some point, tend to reduce compliance incentives. As we will see, noncompliance does not necessarily lead to violating environmental integrity, but it does increase its likelihood.
51. UNFCCC, *Work Program on Mechanisms, Article 17* (November 25, 2000), FCCC/CP/2000/CRP.3. See Richard Baron, *The Commitment-Period Reserve as an Option for Liability*, (Paris: International Energy Agency, February 2001), First draft. A reserve account is often referred to as a “commitment period reserve.”
52. Consider the following example: Country A’s emissions forecast is 70 percent of its target. The reserve requirement is 60 percent. Under the second option (described in the text), Country A would be required to hold only 42 percent (60 percent of 70) of its allowances in the reserve account.
53. Using a 98 percent reserve requirement, and following on the example in Note 52, Russia would have 69 percent in reserve (31 percent marketable), while industrialized country buyers would have only 2 percent marketable allowances.
54. Alexei Pimenov, “The Future That Never Was,” *Wilson Quarterly* (Spring 2000): pp. 59-67. See also Soros, pp. 10-16 (Note 25); Lee S. Wolosky, “Putin’s Plutocrat Problem,” *Foreign Affairs*, Vol. 79 No. 2, (March-April, 2000): pp. 18-31; Ira W. Lieberman and Rogi Veimetra, “The Rush For State Shares in the ‘Klondyke’ of Wild East Capitalism: Loans-For-Shares Transactions in Russia,” Vol. 29 No. 3, *George Washington Journal of International Law & Economics*, 1996, pp. 737-761; and “Russia’s Battered Press,” *The Economist*, April 21-27, 2001: p. 16.
55. Haites, 1998. (Note 46.)
56. Of course, it depends on the percentage of allowances in the reserve account. Existing proposals have an option of using “projection” methods to determine how much is in the reserve.
57. See Note 3 in Box 4.





The **World Resources Institute** is an environmental think tank that goes beyond research to create practical ways to protect the Earth and improve people's lives. Our mission is to move human society to live in ways that protect Earth's environment for current and future generations.

Our program meets global challenges by using knowledge to catalyze public and private action:

- To reverse damage to ecosystems. We protect the capacity of ecosystems to sustain life and prosperity.
- To expand participation in environmental decisions. We collaborate with partners worldwide to increase people's access to information and influence over decisions about natural resources.
- To avert dangerous climate change. We promote public and private action to ensure a safe climate and sound world economy.
- To increase prosperity while improving the environment. We challenge the private sector to grow by improving environmental and community well-being.

CEP

WRI's Climate, Energy, and Pollution Program aims to reduce the risk of climate change in ways that drive sustainable development worldwide. CEP works with international and local partners to dispel myths, generate solutions, illuminate facts, and channel sustainable energy solutions to governments, corporations, and civil society. CEP's climate change work focuses on two broad areas: policy analysis to help shape the economic, political, and diplomatic aspects of the Framework Convention on Climate Change, the Kyoto Protocol, and subsequent legal instruments; and, second, a broad-based sustainable energy initiative that combines policy analysis with programs and projects implemented at a national or local level in developing countries to reduce energy costs and greenhouse gas emissions. In both the energy and climate treaty work, CEP believes that clear economic and development benefits must accompany measures to slow the use of fossil fuels. For more information please visit <http://www.wri.org/climate>



World Resources Institute

10 G Street, NE

Washington, D.C. 20002 USA

<http://www.wri.org/wri>

ISBN: 1-56973-479-8

