Special Papers

Topical Issues In Enviromental Finance

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1. PURPOSE AND APPROACH

Purpose

The purposes of this paper are to:

- illustrate some practical examples of environmental finance situations;
- demonstrate that all of these situations could benefit from environmental economics and its insights; and,
- suggest some specific topics in environmental finance that might be of interest to EEPSEA researchers.

An underlying goal of the paper is ambitious: to help dissipate the feeling of helplessness that commonly arises when we confront the practical realities of trying to pay for the environmental protection that we want. There are financing approaches that can help, and environmental economics can play an important role in helping them to work. In case this sounds unrealistically optimistic, I add two caveats.

- There still are no free lunches. New money spent on environmental protection remains money that is not spent elsewhere.
- Just throwing more money at current environmental problems is not a long-term solution. Even if environmental finance were to be successful in harnessing more sources of investment, the current policy and institutional constraints would render ineffective much of these investments over the long term.

The paper has been prepared with the financial support of the *Canadian International Development Agency* (CIDA). The paper will be presented at an EEPSEA meeting and subsequently to CIDA project and program managers in Canada.

These are two quite different audiences. The purpose of the presentation to the CIDA project

managers is to stimulate interest in using EEPSEA's environmental economics and finance capabilities in the bilateral projects. Whether that could be done in practice remains to be determined, but a comparison of the EEPSEA knowledge and skills with the topics of the bilateral projects shows real opportunities. The purpose of the presentation to EEPSEA is to suggest some applications of EEPSEA's research results to real-world situations and to outline some new research topics in environmental finance that might be of interest to EEPSEA researchers.

Because the audiences are so different, some of the material in this paper will be well known to EEPSEA participants. During the presentation at the EEPSEA meeting, I will focus on the parts that suggest new practical applications and possible new research topics.

Approach

I take a practical approach to the topic, working from the bottom up rather than the top down. This is not intended to be a paper on macro-economic efficiency issues in alternative approaches to paying for environmental protection. Nor is it a consideration of the relative merits of, for example, market-based instruments versus command-and-control paid for by general taxation. The goal is more to show what environmental finance can contribute in specific real-world situations.

For some of the environmental finance topics, I use real projects to illustrate the points. Some of the examples come from current CIDA projects in Asia, and I take this opportunity to thank the CIDA managers for their assistance. The examples show why a project is a good illustration of environmental finance issues and how it could benefit from the practical application of expertise in environmental economics. Other examples will come from the experiences of others and myself in environmental economics and finance in Asia and elsewhere.

The focus of much of the literature on environmental finance in Asia is on multilateral financing initiatives such as the Global Environment Facility (GEF), or a new Asian Development Bank (ADB) environmental lending window. These certainly are important topics. But my focus is more on local and national approaches to environmental finance. The current economic conditions in many Asian countries make this a difficult topic. However, eventually, more local and regional environmental finance initiatives will have to be part of the overall solution to the environmental finance problems in the Region.

2. DEFINITION AND THE NEED

Definition: Environmental finance

For our purposes, environmental finance deals with the practical issues of paying for the level of environmental protection or an environmental initiative that a society has decided upon. It doesn't concern itself with how or why or what the society has decided. Rather, it focuses on the real-world problem of paying for whatever goal has been set.

Environmental economics contributes to deciding what the society will do: environmental finance tackles the subsequent problem of paying for it.

I am, deliberately, using loosely the phrase "*environmental protection*". For my purposes, it covers many topics: pollution abatement, water supply, natural resource conservation, etc. Of course, all of these areas fall within EEPSEA's interests.

It comes as a surprise to some to see that environmental finance is being separated out as a finance topic. The point is made that, in the real world, finance issues have already been divided up: municipal

finance, corporate finance, project finance, etc. Why do we need another division, i.e. environmental finance?

The answer is that environmental finance situations have features in common that separate them from other finance situations. One of these common features is that environmental finance situations can all benefit from environmental economics**.**

The Need: Or, Why Bother?

Why do we care about environmental finance? Because it is an important part of "sustainability".

Environmental protection initiatives, like all other human initiatives, are not sustainable without the required financing. Environmental development organizations recognize that *sustainable financing* is an integral part of *sustainable development*. Little happens unless we set aside the money to pay for it on a sustainable basis. Dr. Jeremy Warford, in the Overview to an ADB publication on the topic, provides a review of the evolution of thinking on environmental finance issues.

The money required to pay for environmental protection in Asia has been estimated in numerous sources. For example: the ADB in 1994 estimated the net present value of all environmental investments required during the period 1991-2000 to be $85 billion US.

It can be misleading to take too seriously the details of these macro estimates. There usually are biases in why and how they are produced, and the technical details of definitions, assumptions, etc. need to be examined carefully. As well, these large macro estimates feed the conclusion that it takes large macro institutions to deal with the financing problem. But the point is that no matter what the best estimate is, we know two facts about it:

- it is probably a very big number; and,
- it certainly exceeds the available capital, even before the current economic difficulties in Asian countries.

The conclusion is as clear for Asia as it is for the rest of the world: We don't have enough money set aside to pay for the environmental protection that we want. We have to find the money somewhere and hence the importance of environmental finance.

3. ENVIRONMENTAL FINANCE, ENVIRONMENTAL ECONOMICS AND MARKET-BASED INSTRUMENTS

EEPSEA focuses on environmental economics. Within that topic, a particular priority is market-based instruments for environmental protection. The relationship between environmental finance and each of these is worthy of a short discussion.

Environmental economics and ***environmental finance*** have the same relationship as between general economics and finance. Finance is concerned with the real-world issues of raising capital, etc. for a particular project or initiative. Economics, on the other hand, is concerned with how societal and private values are being created and destroyed.

There is considerable interplay between the two disciplines, but they also conflict frequently. Finance deals more with private benefits and costs, whereas economics interjects societal benefits and costs into calculations.

The general finance field has expanded explosively in the last 25 years. A good example is the field of corporate finance: now dubbed the theory of "*particle finance*". Many economists are left behind by this change, and have only a vague awareness of what has gone on. Yet the expansion has revolutionized the finance field, so much so that it will probably feed back and have an impact on the economics discipline (e.g. opening up the definition of "risk"). It is interesting to note in an excellent recent book on the innovations in financial products that some of the risks being imposed on society by these financial products are likened to environmental externalities imposed by pollution.

That hasn't happened yet in environmental finance, but it is beginning. At the end of the paper we give some brief examples of how environmental finance is developing in the West, particularly in the US (and Canada and Europe, to a lesser extent). The process that is going on we call the *securitization of the environment* (SOTE). It will be interesting to watch the effect of this process on the discipline of environmental economics.

Economic Instruments or Market-based Instruments

Market-based instruments for environmental protection are a priority research area for EEPSEA. Some market-based instruments such as fees and charges can become environmental financing mechanisms if the collected money is put into, for example, an environmental fund or is otherwise applied to environmental protection. But not all market-based instruments are directly connected with environmental finance.

Indirectly, market-based instruments are usually related to environmental finance in that the instruments try to internalize environmental costs and thus determine how the required environmental protection will be paid for.

Of course, the use of markets implies choices. So a society doesn't necessarily get a furtherance of environmental goals through market-based instruments. Market-based instruments can lead to the situation in which a society pays twice for the environmental problem: the first time in the societal costs of the environmental problem, and the second time in the market-based instruments imposed, ostensibly, because of the environmental problem.

Much of the promotion of market-based instruments is based on the economic issues of efficiency. There is a more pragmatic way to view the significance of market-based instruments for developing nations.

Asian countries have jumped past the West's costly development stages in many technical areas: cell phones, computers, industrial manufacturing processes, etc. Why not do the same in environmental management? How? By going directly to a better mix of environmental management approaches:

- command-and-control regulations;
- market-based instruments;
- covenants;
- self-monitoring and reporting and many other features.

Leapfrog the decades of rhetoric that led to the current interest in a more eclectic mix of management tools. I will return to this point later and will make specific recommendations.

4. SOME ISSUES IN ENVIRONMENTAL FINANCE

I now identify a number of typical issues in environmental finance. In some cases, I use real projects or

situations to demonstrate the situation. In others, the description is based on a composite of project experiences.

It will be evident that these situations are not independent. They contain common elements and provide complementary perspectives on the field. The most important common element for our purposes is that all situations could benefit from the insights of environmental economics and finance. My purpose, as stated earlier, is to illustrate practical environmental finance situations and to show how they can benefit from the insights of environmental economics.

I begin with some well-know situations and work into newer fields and topics that I hope will attract the interest of EEPSEA's environmental finance practitioners.

4.1 Equitable financing of environmental protection

This is one of the most common situations encountered in environmental finance. Typically, a community picks an environmental protection or remediation initiative and then has to decide who should pay for it, and how they should pay.

Here are two common situations.

- *The degradation of a common resource by one activity*. Exhibit 1 portrays a situation in which the drainage from an open pit coal mine is polluting seriously a valuable feature of the natural environment and the local seashore. Although from a developing country, this situation is common in many countries, developed and developing alike.

- *The management of municipal solid waste*. Exhibit 2 portrays a common situation. The existing solid waste system is not keeping up with the increasing volumes being generated. Bad odors and unsightly rubble are deterring tourists (both nationals and internationals). Local health problems are increasing. Scavengers are missing income by not understanding recycling markets. Scavengers and collectors are fighting instead of cooperating to seize on market opportunities.

In both situations, the community has decided what to do. For example: drainage ditches will be dug to channel the coal-soaked runoff into settling ponds; and, the landfill liner will be upgraded and local scavengers will be trained to do more effective recovery and recycling. Both actions are short-term, in that they do not solve the longer-term problem. But they are a start. They also cost money.

Here are some of the common questions that then arise:

- who should pay the costs of these projects?
- how will the ongoing operations and maintenance costs be paid for?
- how should the collected money be spent and accounted for?
- could money be lent to local groups (scavengers, coal recovery enterprises, etc.) to get them started in businesses?

Communities sometimes find compromise answers to the question, but they can also end up in rancorous arguments about who is to blame for the problem, who can afford to pay, etc.

Environmental economics can contribute to the issue by showing that there are some useful principles and measurement methods that can clarify the facts of the situation. Of course, clarification does not always lead to resolution of disputes.

Two of the most common principles that are drawn upon are the *polluter pays* principle, and the *beneficiary pays* principle.

- *Polluter pays*. This is the most common principle drawn on in issues of who should pay. And it is equally common to label the proximate discharger as "the polluter". However, as environmental economists know well, this can be a simplistic approach. Environmental economics can contribute by showing that, in some cases, the immediate polluter is as much a victim of circumstances as are those whose environment is being polluted. Local communities don't always treat this information as good news, but it can make the ensuing arguments a little more insightful.

- *Beneficiary pays.* Although not always recognized as a principle, this approach is sometimes added onto, *defacto*, the polluter pays approach. There are usually two groups of beneficiaries: those who benefit from the current environmental degradation (usually by avoiding costs), and those who benefit from the proposed environmental protection and remediation. The proximate polluters are almost always beneficiaries in the first group, but the second group of beneficiaries is usually different from the direct polluters. In the case of local pollutant discharges, beneficiaries of environmental protection can be local householders, other local industries, etc. Environmental economics helps by valuing the benefits derived by these groups from the proposed environmental protection initiatives. These benefits estimates then become important elements of more equitable payment approaches. There are many programs, such as tax increment financing, that distribute the costs according to the type and size of benefits derived.

Exhibit #3 presents an actual project in Phuket, Thailand that was successful in starting to address the problems of paying for improvement to municipal solid waste management. *CIDA* and the *International Center for Sustainable Cities* is now taking the lessons learned in that project and applying them to six other cities in Asia: two in Thailand, two in the Philippines and two in Indonesia. Each of these follow-on projects would benefit from, for example:

- Practical guidelines for a local solid waste management investment fund to, for example, stimulate composting initiatives, teach recovery and recycling to local scavengers, and to demonstrate the practicality of such funds; and,

- Simple workbooks on the polluter-pays and beneficiary-pays principles and how they can help to identify equitable and realistic financing options.

4.2 Environmental Funds

"Environmental funds" are arrangements whereby earmarked revenues are channeled into environmental protection or restoration. The revenues are channeled from those who pay into the fund to those who withdraw (temporarily or permanently) from the fund.

There has been interest in "*national environmental funds"* (*NEFs*) in recent years, especially in the developing economies of Asia and Latin America and the transition economies of Eastern Europe. NEFs have arisen mainly because of a perceived shortage of capital available for pollution abatement and prevention, as well as for environmental restoration. However, such funds do not have to be national: they could be sectoral, regional etc.

Environmental funds serve many different objectives:

- preserve biodiversity;

- promote environmental research;
- build and maintain environmental institutions;
- invest in pollution abatement equipment and infrastructure;
- etc.

The first international forum on these funds was held just over four years ago. Sponsored by the World Conservation Union, The Nature Conservancy and the World Wildlife Fund, the conference report summarizes many of the lessons learned from NEFs around the world.

The World Bank and the Organization for Economic Cooperation and Development (OECD) have also taken interest in NEFs. The OECD published in 1995 a useful report on NEFs, including what are called the "*St. Petersburg Guidelines*" on establishing, operating and monitoring environmental funds in developing and transition economies. The World Bank has taken a broader look at the question of financing pollution abatement in developing countries and published a survey report that positions NEFs in the context of all financing possibilities. An Asian Development Bank (ADB) publication contained one article suggesting a need to create a new "Asian Regional Environment Facility" for the Bank, while another article doubted the usefulness of such a facility.

China has a long history of using environmental funds, both national and local. Apparently the local environmental funds have been the pioneers. Developed while the country was under centralized economic management, these funds are facing challenges of the current transition. It is expected that these funds will continue to play an important role in capital markets for environmental investment. A summary of lessons learned and recommendations for both national and local environmental funds is contained in a recent report.

It is useful to categorize the different funds by five criteria:

- *comprehensive vs. specific goals* : Does the fund provide finance for a broad range of environmental problems (air, water, soil, noise, etc.) or is it aimed at specific problems or at specific sectors (municipal, manufacturing, chemical etc.)?
- *territorial scope*: Is it national, or does it concentrate on specific areas?
- *institutional arrangements:* What institutions direct, manage and monitor the fund? Are existing financial and environmental institutions used, or are new ones established?
- *sources of revenues*: Are environmental taxes and charges the main sources? International endowments? Debt-for-nature swaps? Are there plans to broaden the sources of revenue, or is fixed at initiation?
- *grants vs. loans*: Is the fund to revolve, with the interest covering inflation, administration expenses, etc.? Or is it to be a straight grant, perhaps subsidizing existing commercial loan rates, with no consideration for repayment?

There are many more detailed design questions but these five serve to differentiate well the major types of funds. Of course, the answers usually change over time as the country and its environmental problems change.

A vexatious question here is whether environmental funds are justified on economic efficiency grounds. Do they distort resource allocation priorities through earmarking, or are they useful tools of environmental and fiscal policy? I am not aware of any theoretical satisfactory answer to this question. Environmentalists often ignore the question. Their belief is that any money raised for environmental protection is a good thing, no matter what its origins, as long it is truly incremental (in particular, as long as it is not accompanied by reductions in environmental resource allocations elsewhere). The World Bank, in a dissemination note, takes a pragmatic view, suggesting that these funds be viewed as

"temporary instruments" because they can postpone, rather than resolve, the underlying problems of inadequate regulations and inefficiencies in the environmental financing mechanisms. How long is "temporary"? If the intent is to wait until all market inefficiencies are resolved, then "temporary" could be quite long as we see in the OECD economies. However, it is certainly true that environmental funds are not effective solutions to capital market imperfections. They can become just another way in which capital markets mis-allocate resources. Careful design can reduce this problem, but it will always remain. We will encounter some examples of this later.

Here are some of the important design questions for environmental funds, and some comments on the possible answers. The bibliography at the end provides references for a more detailed consideration of these and other points.

- *Should the fund lend capital on its own account or subsidize commercial interest charges*? That is, should the fund do full project financing or just subsidize the incremental costs to bring the terms of the environmental project loan into line with commercial loan rates? Lending capital on its own account leads to a much larger fund and institution to assess risks, handle repayments, monitoring, etc. On the other hand, working through existing financial institutions can lead to problems also.

- *Should the fund provide loan guarantees*? The approach of loan guarantees is deceptively simple. In fact, it can lead to an under-estimation of project risk because the fund is backstopping failure. I think the answer is a resounding "no", as explained well in the OECD publication. Some of the dangers of this approach come from the peculiarities of cash-based accounting practices of public sector agencies.

- *Where will the fund's revenues come from*? Environmental fees and charges? Affinity programs? General government revenues? Combinations of these sources? Charges, fees and fines on pollutant emissions are, in my opinion, the most appropriate sources of revenues.

- If fees and charges are the main revenue sources, then:
- *what are their purposes*? Change behaviour, raise revenue, both?
- *how much should the fees and charges be*? Damage compensation, meet revenue targets, minimize competitiveness effects, other?
- *what is the basis of payment*? Inputs, outputs, environmental effects, other?
- *how do the fees and charges relate to environmental standards* (if any)? For example: fees/ charges up to the standards, fines if standards are exceeded?

- *Who should pay into the fund*? The polluters, the beneficiaries, others?

- *Should the fund use existing intermediaries (usually financial) to disburse, monitor and collect its resources*? The advantage to doing so is the reduction in delivery costs. New institutions do not have to be created. The disadvantage is that the financial institutions can end up putting part of their unwanted loan portfolio into the environmental fund. Or, the institution can become adept at using the fund's resources to co-finance projects that the institution would have financed entirely on its own, if the fund had not been there. Careful segregation of project assessment responsibilities can reduce this latter problem, but it is difficult to avoid completely.

- *What is the relationship between the fund and the environmental priorities*? An environment fund cannot do the job on its own. The fund must be integrated with the other environmental, economic, financial and social policies and institutions within which it must work. In particular, the fund should reinforce other environmental policy instruments. A fund should

state, in its charter or equivalent, how it fits in to the overall environmental priorities for the appropriate country, region or sector.

- *What happens to industry sectors that are going to fail? What if they are the State-Owned Enterprises*? This can become a difficult problem for a fund. An advantage of using an existing financial intermediary is that it can, in theory, make the commercial decision to not back, say, an industry sector that is under serious competitive pressures. But what if that sector consists of SOE's and they come to the fund looking for a loan? In theory, supporting, for example, inefficient state-owned enterprises, should not be the function of an environmental fund. In practice, the issue becomes more difficult. Especially if lack of environmental compliance is one of the reasons why the threatened firms are in difficulty.

- *How should economic costs be treated in the project analysis*? The investment analysis that precedes the decision to lend will presumably be based on financial/accounting costs because of the need to fit in with current commercial practices. But if the environmental fund is supposed to fit in with overall environmental policies, then presumably the fund's practices should also serve to educate the public about the social costs of environmental degradation. How should these economic costs be reported in the project assessment? Or should they be?

Environmental funds are important to all countries in the Region. As we see from the examples, there are many situations that would benefit from guidelines on how to set up and operate these funds to address local or regional environmental problems. These funds represent one way in which communities and regions can begin to raise money to pay for required environmental protection and restoration.

One approach would be to establish a *Center of Excellence On Asian Local And Sectoral Environmental Funds* at an Asian research institution. I stress that, in my opinion, the world does not need another general survey of practices or a rehashing of economic theory issues. What the Region would benefit from is a realistic set of guidelines for making these funds work in particular situations. The experiences of China, Thailand, the Philippines and Singapore provide a wealth of useful information.

Environmental fees and charges are usually a building block of an environmental fund. I offer the two following exhibits to help start that process. The first is a set of principles used to design such a program for an Asian country. The second is a set of pragmatic "facts of life" about environmental fees and charges.

4.3 Practical Uses Of Economic Costs and Values

This, of course, is EEPSEA's chosen field. It has sponsored good research in the field and many of its research reports identify and value economic costs.

Environmental economists are used to producing estimates of economic costs and values, especially for natural resources and amenities (water, air, clear view, etc.). The economic costs and values then get used to support changes in absolute and relative prices, and in many other policy issues. One of the most comprehensive assessments of economic costs of environmental degradation is EEPSEA's work on damages resulting from the haze in Southeast Asia.

Another recent example of this approach was the report on marginal opportunity costs for water, coal and timber in China, produced by the China Council for International Cooperation and Development. This work, co-funded by CIDA, produced useful estimates of the marginal opportunity costs for each of these resources. A summary of the results is presented in Exhibit #6.

Environmental finance practitioners also draw on these estimates to aid in proposing equitable approaches to financing, for example, improved wastewater treatment, more efficient water usage in industrial production, etc. Exhibit #7 presents a project just beginning in the Philippines, designed to improve the management of two watershed ecosystems. Even preliminary estimates of marginal opportunity costs for water in the two cities would contribute to the development of effective watershed plans. Water pricing to encourage efficiency will probably be an important component of better watershed management, and marginal opportunity costs can help in setting both the direction and magnitude of the price changes. EEPSEA has a number of research reports that estimate MOC's for water, in particular in the Philippines. A current EEPSEA project in the Philippines is also relevant. The methods and results of the EEPSEA research will prove useful to the watershed management projects, once the appropriate local management Boards are established.

One particular way in which these economic costs can be useful, although controversial, is when the distributional impacts of the costs get examined in more detail. Consider the coal mining operation of Exhibit #1 presented earlier. A general level of environmental cost was borne by the entire country in the final consumption of the coal mined (sulfur and soot deposition, etc.) but the local mining community probably bore the brunt of the total environmental cost (the MEC of Exhibit #6). The local community not only consumed the coal as did other communities, but it also suffered under the considerable localized environmental degradation depicted in the Example. It would have been useful to have estimates of at least the relative magnitudes of the local community external costs versus the country-level external costs, to assist the mining community to press its case for greater

compensation from the rest of the country. Of course, the rest of the country countered that the local mining community was also reaping the economic benefits of the local coal mine. Local groups differed as to which was larger: the local financial benefits or the localized environmental and health costs.

A common problem in making practical use of these estimates of economic costs and values is that it is usually difficult to explain their meaning, their uses and their abuses. This is a challenge to all environmental economists. The challenge is even more formidable when any of the values are based on approaches such as "Willingness to Pay/Be Compensated". The opportunities for mis-using such costs and value estimates are many.

4.4 Financing Environmental Protection in State-Owned Enterprises (SOE's)

The SOE's are just one of the issues confronting countries moving from centralized economic planning to a greater reliance on market mechanisms. However, they can be a particularly urgent environmental problem in that they usually are the large "smoke-stack" industries, with outdated and polluting manufacturing equipment and employing a sometimes-significant percentage of the labor force. Typical examples are steel, electricity generation and some mining.

The SOE's often are in dire financial straits. Finding money for environmental protection can be difficult. The costs and prices that SOE's face often are set arbitrarily and are difficult to change.

Some practical financing approach must be found for the SOE's to improve their environmental performance. The China project that determined MOC's of resource utilization provides examples of "win-win" price movements that could yield revenue for environmental protection. The Vietnamese company VINACOAL has been considering establishing an environmental fund for the company to improve its environmental performance in mining, processing and transportation activities.

Environmental economics and finance might be able to offer some practical places to begin.

4.5 Practical, Small-Scale Tradable Emission Permit Schemes

This topic is particularly interesting to environmental finance specialists because of the potential for these schemes to deliver environmental protection at lower cost than alternatives.

The theoretical benefits of tradable emission permit schemes, compared to command-and-control approaches, have been known for many years. Over the last decade, the practical benefits of these permit schemes have been demonstrated in some well-known cases. There has been sufficient experience with these approaches to generate useful sets of "lessons learned" and design criteria for effective systems. The first of these two references contains a useful summary of the international experience, most of it from the US. The second paper, by Robert Stavins, contains an up-to-date summary of current results on key issues such as the importance of the initial allocation. This article points out an interesting feature of trading systems, namely that they can foster cost-effective improvements even if no trading takes place. These are significant advantages over the command-and-control or technology-based approaches.

One of the consistent lessons learned across all reviews is that the "*cap and trade*" approach is much better than the "*credit and trade*" approach. In the first, an absolute baseline is set, credits are allocated somehow and trading takes place within the absolute baseline. In the second, each participant gets to declare its own baseline and can trade reductions from that baseline.

Another interesting lessons has to do with the initial allocation of permits. Recall that one of the benefits of a trading system is that, according to theory, the initial method of allocation is not important because the same equilibrium allocation will result, no matter what the initial conditions. Unfortunately, that is not the case in the real world. Two problems intervene:

- transaction costs do make a big difference in the actual trading that takes place and can make the free-distribution approach more costly than alternatives; and
- Freely distributed tradable permits can exacerbate existing distortions in the economy due to interactions with existing taxes.

I want to focus on another lesson learned, but one that is used to dampen enthusiasm for trading systems rather than support the approach. Experience suggests that the markets for the permits must be "liquid" so that trading will take place. Frequently, that is interpreted to mean that there must be many players that are covered by the trading program and that they must be sufficiently at arm's length so as to avoid "strategic behaviour". For "strategic behaviour" read "market manipulation".

In some economies and situations, that is probably a necessary condition. However, I have witnessed situations, in Asia, Canada and Latin America, in which a tentative proposal to design a tradable emission permit scheme has been dropped because of this concern about the market being sufficiently liquid. Typically, the concern has been that the market will be too small- too few players for trading to take place. Related concerns were about the need for strong regulatory frameworks, enforcement schemes etc. that are typical of the trading schemes in place in the US.

I think that these two premises (the need for large markets and for strong regulatory frameworks) should be examined critically. Are they relevant to Asia? In particular, is it true that nothing useful can be done with tradable emission permit schemes in the absence of these two conditions? I doubt it, especially if a tradable permit system is compared to the realistic alternatives.

In the analysis for the China Council of pollution from coal, the authors propose the use of tradable emission permits to achieve ambient standards for sulfur in regions of China where SO_2 emissions cause problems. An EEPSEA report also proposed a tradable discharge permits system for water pollution in a Province of China, although the authors focus on a number of implementation difficulties.

If we expect tradable emission permits schemes to deliver perfection, then our feasibility assessment will quickly prove that they will not. But the appropriate comparison should be against, not perfection, but what is being achieved with the existing set of environmental protection approaches. It is possible that a simple system of tradable emission permits will not look so bad if it is assessed against the realistic alternative.

For example: Western economies need elaborate regulatory and enforcement mechanisms for tradable permit schemes because the trading schemes are being added on to existing regulations, structured voluntary agreements etc. It must be possible to prevent backsliding and complex, technical cheating. What if the current state of environmental protection is not so sophisticated? Does a tradable permit system have to meet standards that none of the other approaches has to meet? Or are there situations in which simple tradable permit schemes could deliver at least as much environmental protection as the other approaches, and encourage the perspective of a shared environmental resource (the air, water, etc.)? This latter point sometimes results if the tradable permit system is based on an ambient rather than point source approach to environmental protection.

Consider the simple situation of Exhibit #8: two industries polluting the common air of a valley with the same pollutant, say, dust. The villagers are getting sick; dust and dirt are everywhere, the usual litany of problems. Environmental protection resources are limited, as is the technology available for monitoring. The automatic reaction in many environmental protection agencies is to go for command-and-control approach.

A useful topic for research would be to lay out practical design criteria for trading programs in real world situations like this one. When might they be at least as effective as the alternatives? How should they be implemented? How will the program probably evolve over time? And, most importantly, where can we get started with a pilot project?

Here is a summary of four lessons for identifying potential new applications, presented in Stavins' recent article.

1. The most important factor affecting performance of the tradable permit system is the heterogeneity of the abatement costs among the sources.

2. The closer the pollutant is to being uniformly mixed in the environment, the more suitable it will be for market-based instruments such as tradable permits.

3. Use tradable permit systems for reducing emissions, not just for reallocating them under an existing regulatory level.

4. Past successes cannot be extrapolated to new applications.

My earnest hope is that someone picks up on this suggestion and starts a pilot project on small-scale trading opportunities in Asia. I offer a strategy, called the *Three S's*:

- start **SMALL**;
- keep it **SIMPLE**; and, most importantly,
- start **SOON**.

4.6 The Alchemy of Environmental Finance: CO_2 è Pesos, Baht, VN Dong, NTD, etc.

The catalyst for this alchemy is the *Kyoto Protocol*. But environmental economics and finance will be necessary ingredients to make the reaction happen. Recall that the Protocol is about global warming and the contribution of Greenhouse Gases to the problem. CO_2 is the major Greenhouse Gas.

The *Protocol* proposes to utilize international trading of CO_2 emission permits as a way of achieving the emission reduction targets built into the Protocol. To demonstrate the potential importance of emissions trading, one recent study has estimated that the US costs of achieving its reduction target would fall from $108 per ton of carbon (no international trading case), to about $26 per ton (full international trading case). As you can see, there is a lot of money at stake here.

There are three cooperative implementation mechanisms envisaged in the *Protocol*: regular emissions trading among Annex B countries; *Joint Implementation* (JI); and, the *Clean Development Mechanism* (CDM). The details of these proposed types of trading are still uncertain and may begin to be sorted out this month at the meetings in Buenos Aires. It is the *CDM* that is of particular interest to us. Recall that the *CDM* is designed to assist countries not participating directly in the Protocol to contribute to the ultimate objective of reducing GHG emissions. Thus, all Asian countries represented here are potential participants under the CDM.

The CDM is proposed as a mechanism to encourage the Annex B countries (Japan, European countries, the US, Australia, Canada, etc.) to undertake projects in the non-Annex B countries that will reduce the CO_2 emissions that would have resulted without the project intervention.

Asian, and other developing countries, have some interesting options under this Protocol. For the purposes of this paper, I assume that the necessary number of countries that account for the required percentage of CO_2 emissions will ratify the *Protocol* (or something like it).

Countries not covered by the trading proposals (i.e. non-Annex B countries) have at least two major options:

- sign on voluntarily to Annex B, negotiate a cap and have all international trading mechanisms available; or,

- don't sign on and have only the CDM available to them to participate in the Protocol.

From a financial perspective, the choice might seem an obvious one. Why even consider undertaking a constraint voluntarily? In fact, the situation might not be that simple. It depends, in part, on a country's inventory of CO_2 contributors and on the stage of development of the country's power generation sector in particular.

For our purposes this morning, we assume that a country decides to not opt into the *Protocol*, but wants to explore its options under the *CDM*.

The *CDM* represents an interesting example of truly "win-win" or "no regrets" opportunities. Why? In part, because of the way in which co2 is produced and released to the atmosphere. There is a point here that is not widely appreciated by those looking at the implementation of the *CDM* in the developing countries. Note that my comments are confined largely to stationary sources of CO_2 in particular to power generation facilities.

CO_2 is different from many of the other air pollutants that we in environmental economics and environmental protection are used to dealing with. One important difference is that there is not a list of abatement technologies (i.e. smoke stack technologies) that you can choose from to reduce the emissions. So reducing CO_2 emissions is largely a matter of increasing the efficiency of combustion, i.e. of power generation in the case we are considering. Less fuel in means less CO_2 out. In fact, current inventories of CO_2 emissions are produced mainly from statistics on fuel consumed, the relationship is assumed to be that direct.

Why is this a "win-win" situation? Because the developing country participating in the *CDM* project gets an increase in fuel efficiency and the foreign investor gets a CO_2 reduction credit. The host country gets the same amount of energy for less fuel or more energy for the same fuel; the investor gets a reduction credit at a price that is presumably below her domestic cost of reduction. Note that both benefits are market-priced. In theory, there will be no need to resort to social opportunity costs in doing these deals. Of course, that is the whole purpose of market-based instruments such as these tradable emission permits.

In practice, it will get more complicated. The parties to the *Protocol* want to avoid the situation in which investments that would have been made anyway now get re-labeled as CDM initiatives and no real reductions in CO_2 are made. Hence, the need to prove "additionality". Those of you familiar with the GEF will know the approach that they took. In fact, we visited it during our virtual safari at the last EEPSEA meeting, thanks to Jack Ruitenbeek.

One of the proposals is to take this GEF approach and apply it, *mutatis mutandis*, to the CDM. My personal opinion is that a different approach will be required, one using only market prices.

This is definitely a field for environmental economics, but for environmental finance also. The prices for CDM opportunities will be set through complex interplay of public and private interests and prices.

I think that this Region would benefit from a ***Center of Excellence on Identifying and Pricing CDM Opportunities***, to assist countries to identify opportunities and price properly their participation in the CDM. Individual power generation companies are already onto this opportunity. For countries with state-owned generation utilities, it is important that the deals signed return the highest possible advantages in fuel efficiency and that the deals contribute to the overall energy plan. Environmental finance, drawing on the tenets of environmental economics, would be an important part of this Center of Excellence. But there is a need to act quickly. CDM emission reduction credits can be accrued beginning in the year 2000. The first ones to enter seriously this field will have a competitive advantage.

I want to stress one point. This alchemy is not just idle banter of the "chattering classes". It is happening right now, and in this region. There are anecdotal reports of major power generation and wholesaling companies, along with environmental brokerages, offering for sale CO_2 emission reduction credits for early years in the next century. Apparently these reduction credits come with guarantees that they will meet whatever detailed regulatory requirements are in place at that time. It seems clear to me that these

companies are out in the region (and elsewhere), signing up the low-cost CMD opportunities that will swing into place once implementation of the Protocol becomes more certain.

4.7 Debt Swaps For Environmental Protection and Sustainable Development

Until recently, debt swaps for sustainable development were seen as an exotic, highly expensive form of financing sustainable development in the developing world. An excellent recent publication has shown that that does not have to be the case. That publication also contains a good reference list of material on debt swaps.

In overview, these swaps usually involve an NGO:

- first, purchasing the discounted debt of a developing country using the NGO's hard foreign currency (US dollars, German marks, Yen, etc.);
- then selling the debt back to the developing country in local currency but at a price above that paid by the NGO; and,
- finally, the NGO investing the surplus in an approved sustainable development project in the developing country.

The underlying premise is that the NGO can purchase the debt at a significant discount to its face value. The discount must be significant to make the whole transaction worthwhile.

In practice, of course, the whole thing gets more complicated. In some situations, the practical issues are quite interesting. High inflation can mean that the surplus that is to be invested in sustainable development can quickly become worthless. So it has to be spent quickly, or hoarded carefully.

Debt swaps for environmental protection have now become respectable components of project-level financing. The current economic difficulties in many Asian economies suggest that environmental protection resources might be in short supply. Species protection is one class of activity that usually gets curtailed quickly when resources get scarce. Perhaps these swaps offer an alternative, at least at the project level. It could be useful to prepare a screening check-list of the situations in EEPSEA member countries to which this approach might be applicable, and some practical guidelines on how to make the swaps work.

4.8 Securitization of The Environment (SOTE)

The phrase "securitization of the environment" refers to the process of turning components of the environment into tradable environmental financial instruments or products. It gets tricky to refer to these instruments as "securities" because that is a technical term in some jurisdictions. If a financial instrument gets labeled a "security", it can become subject to strict regulatory requirements.

Some of the environmental finance examples that we have reviewed already are examples of securitization of the environment: debt for environment swaps, tradable emission permits, etc. take a component of the environment and turn it into a financial instrument. Some of these instruments are tradable and thus become tradable environmental financial instruments (or products). Most market-based instruments for environmental protection are, implicitly, examples of this securitization move. Here are some other examples of securitization of the environment.

- ***Pre-selling of access rights to a water supply or wastewater treatment facility***. This is an interesting way of getting the upfront capital required to build such a facility in advance of the housing developments, industries etc. that will ultimately make use of the water facility. The

access rights to the water facility are turned into tradable financial instruments. The initial sale of the access rights raises enough capital for the facility to be built. The access rights are then bought and sold, by both speculators and developers, until the required development takes place.

- ***Derivative environmental financial products***. Recall that derivatives, sometimes called the "wild beast" of finance, are products that derive their value from some other underlying interest. Options such as calls and puts, or futures and forwards, are examples of derivative financial products. Forwards, calls and puts are all trading "over the counter" (OTC) on, for example, the US SO_2 emissions market for utilities. In the US, joint ventures are being formed between engineering companies and Wall Street financial services firms to define and price new environmental financial products as part of environmental risk management practices.

- ***Industrial products sold into environmental markets***. We are all familiar with so-called "green" products that have desirable environmental properties. Some industrial products are now being developed and marketed as tools for polluting industries to use to achieve cost-effective required reductions other than in their home operations. For example: Ontario Hydro in my home Province purchased 35 tons of Nitrogen Oxide (NOx) emission reduction credits created by the use of one of the VEKTRON Series 3000 fuel additives developed by the fuel additives business of the U.S. based Shell Chemical Company. The additives are supplied to retail gasoline outlets in the Toronto area. The non-metallic additive helps to reduce NOx and Volatile Organic Compounds (VOCs) emissions from cars. These two substances are the major contributors to smog. Consumers will not see an increase in price at the pumps. By purchasing these reduction credits the utility gained flexibility in managing the impacts of its fossil fuel generating stations. The 35 tons of reduction credits Ontario Hydro is purchasing is equivalent to the amount of NOx produced by 9,000 cars over a two and half month period. Hydro paid about $55,000 for the additives.

- ***Carbon sequestration instruments***. Costa Rica has already signed some significant deals involving the use of domestic forest reserves and new growth as carbon sequestration agents. The absorptive capacity of the forests becomes an environmental financial instrument that may become tradable.

This field is new and evolving rapidly, as the world tries to harness market forces to help in the urgent environmental problems that we face.

Are their examples within this securitization process that are relevant to Asian countries? As I noted at the beginning of the paper, Asian nations have leapfrogged ahead of the West in so many areas. Why not in environmental management also?

5. CONCLUSIONS AND RECOMMENDATIONS

Sustainable financing is an important component of sustainable development. Without sustainable financing, little happens.

Environmental finance is as much a separate topic in the finance field as are corporate finance, municipal finance and project finance. A common feature of environmental finance situations is that they benefit from the application of principles and results of environmental economics.

Here are some practical research topics in environmental finance that I suggest to EEPSEA researchers for consideration. For each topic, I provide some suggestions on approaches.

1. Equitable Financing Approaches In Real Situations

- Pick common situation(s) such as local solid waste management initiatives or water quality improvement.
- Provide practical tips on how to apply the polluter and beneficiary pays principles in that type of situation. For example: identifying polluters and beneficiaries; estimating the benefits derived; turning those estimates into financing schemes.
- Prepare a menu of local financing schemes for the situation in a selected country (tax increment financing, affinity programs, environmental funds etc.). Show how to make each approach work.

2. Local And Sectoral Environmental Funds

- Design a local fund for a real situation. Specify who pays, how much they pay, the basis for payment, relationships to existing environmental standards, re-investment criteria, avoiding inter-regional and boundary conflicts, levering other sources of money etc.
- Show how the characteristics of the local situation affect the design choices for the fund. Prepare a "cookbook" for design.
- Give answers to all the questions. Show the tradeoffs.

3. Design practical market-based instruments for environmental protection

- Pick a real situation (for example: water pollution in a local area, air pollution in a basin). Design in detail a market-based instrument to help.
- Make it part of an eclectic environmental management mix. Design the other components too.
- Answer all the design questions. Show how the answers are related to the local characteristics. Give an implementation schedule.
- Enough theory and general reviews have been done. Show that this approach is no worse, and maybe even better, than an environmental management mix without market-based instruments.

4. Small Scale Tradable Emission Permit Schemes

- Show that these schemes can be as cost-effective as command-and-control approaches, even in the absence of the conditions deemed necessary in the developed economies.
- Pick a typical situation, design the details: who is covered, baselines, rules of trading, monitoring, enforcement, sanctions, etc.

5. CDM Opportunities in SE Asia and China

- Show how to identify and price opportunities in Southeast Asia and China.
- Do it in a real situation. Work through the numbers.
- Get ready for the phone calls, just in case.

6. Debt for Nature Swaps

- Pick an area such as species protection. Show the characteristics of situations necessary for these swaps to work.
- Find such a situation. Make it work.
- Apply the success to other, similar situations.

7. Securitization of the Environment

- What does this process mean to Asian economies? Are there opportunities to get directly into the process? Or is it necessary to await further changes in financial and environmental management institutions?

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