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# East Asia's Environment

Principles and Priorities  
for Action

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Jeffrey S. Hammer  
Sudhir Shetty

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287



World Bank Discussion Papers

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# East Asia's Environment

## Principles and Priorities for Action

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Jeffrey S. Hammer  
Sudhir Shetty

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## CONTENTS

<b>Foreword</b>		v
<b>Abstract</b>		vii
<b>Acknowledgements</b>		viii
<b>I. OVERVIEW</b>		1
<b>II. THE ENVIRONMENTAL CHALLENGE</b>		2
Environmental Stresses		2
Development at Risk		4
<b>III. THE SOURCE OF THE PROBLEM</b>		8
Why Growth is Not the Problem		10
Governments Can Make Things Better -- or Worse		10
Why the Current Approach is not Working		12
Obstacles to Using Charges		14
<b>IV. PATHS TO IMPROVED POLICIES</b>		16
Set Priorities and Address Urgent Problems First		16
Use Markets More		21
Simplify Policies		25
Evaluate Public Investments Correctly		26
Build Institutional Capacity		27
Collect and Disseminate Information		28
Conclusion		29
<b>BIBLIOGRAPHICAL NOTE</b>		30
<b>OTHER SOURCES</b>		31

## TABLES IN TEXT

1.	Countries in East Asia phased out most energy subsidies.....	3
2.	Differences in treatment costs for top 100 water-polluting industrial firms, Metro Manila .....	13
3.	Concentration of stationary air pollution sources in Metropolitan Manila.....	21

## FIGURES IN TEXT

1.	Nine of fifteen cities with the highest levels of suspended particulate matter in East Asia .....	5
2.	Energy consumption closely follows economic growth.....	6
3.	As does car ownership.....	6
4.	Deforestation in East Asia is outpacing that in other regions .....	8

## BOXES IN TEXT

1.	The cost of reducing pollution -- and of failing to reduce pollution.....	9
2.	The high cost of inappropriate environmental protection policies .....	13
3.	Examples of market-based environmental policies .....	15
4.	Priorities for pollution control depend on the policies chosen and administrative capabilities .....	18
5.	Environment priorities in selected East Asian countries .....	19
6.	Pollution taxes or standards -- who gets the benefits? .....	24

## Foreword

Environment policy is now among the Bank's core concerns. An important goal in designing environmental policies is economic efficiency, requiring a serious examination of the most productive means of achieving a cleaner environment. It is not sufficient to enact cosmetic changes in environmental standards and it is not realistic to ignore growing needs for energy and of urban services. This report surveys some of the analytical work and policy analysis that has been done in the East Asian region of the World Bank. It recommends that more emphasis be placed on tax instruments for environmental management and reviews the experience of countries in implementing such reforms. By integrating environmental analysis and policy with general economic policies, progress on both protecting the environment and maintain rapid economic growth can be achieved.

**Russell Cheetham**  
Vice President  
East Asia and Pacific Region



### Abstract

This paper examines policy options for addressing environmental degradation in East Asia. Drawing on environmental analyses done in the region, the principal threats to the environment, their underlying causes and the most promising avenues for addressing them are identified. The role of economic incentives, or, market-based policies is highlighted.

While much has been accomplished in East Asia, the main areas that remain high on the agenda are the removal of remaining subsidies for environmentally-damaging activities (particularly water use and forestry), the clarification of property rights (particularly of land in ecologically-vulnerable areas) and, most importantly, the imposition of taxes on polluting activities. The latter option is examined in some detail in terms of: increased efficiency relative to current practices, the potential for increasing government revenues in a non-distorting manner and the experience of developed and developing countries in using such instruments. The paper concludes that taxing environmental "bads" such as pollution and overuse of natural resources instead of economic "goods" such as profits, wages and trade makes too much sense to be ignored.

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## I. Overview

East Asia is the development success story of the past quarter century. Real per capita incomes have quadrupled, life expectancy has risen by a full 10 years and the percentage of people living in absolute poverty has shrunk from a third to about a tenth. Those successes have been built on a sound foundation of prudent macroeconomic policies and a judicious mix of government intervention and reliance on markets. The regions' achievements now command the attention of policymakers in other parts of the developing world.

An important remaining policy frontier is the environment. The environmental challenges East Asia faces are similar to those confronting other developing countries. In some respects, East Asia has done more than other regions to address them. It has reduced subsidies on electric power and enacted environmental legislation. But two aspects of East Asia's growth make its problems more severe. Population densities in many countries in the region are among the highest in the world, so that more people are exposed to environmental impacts. And the recent rapid growth of many of the region's economies means that sustained action is more difficult because newer environmental problems, such as hazardous wastes and vehicles emissions, now coexist with more traditional causes of environmental damage such as inadequate sanitation. Air and water pollution, soil contamination, destruction of forests and other natural habitats, soil erosion and salinization are problems already severe in many parts of East Asia. If these environmental threats are ignored, the damage that results could reverse the welfare gains that have come with rising incomes.

Environmental problems require attention because markets alone cannot be relied on to reduce excessive damage to the environment. The costs to society that come from pollution and the degradation of natural resources are not automatically taken into account in the decision of businesses, governments, and individuals. That does not mean that the only way to slow environmental damage is to slow economic growth. There are ways to incorporate environmental costs into private and public decisions. In defining and choosing ways in which these environmental costs are internalized, governments have a critical role to play.

In the past, environmental policies have relied too much on regulations, an approach that often exacerbated environmental problems rather than ameliorating them. Polluters and resource users do not generally pay for the damages that resulted from their actions. Often, too, governments have failed to prioritize their country's environmental problems, so that the most urgent problems received inadequate attention and conditions worsened. And where there have been improvements, they have often cost too much. From the successes and failures of policies in East Asian and OECD countries, this paper makes a key recommendation for reform:

**Charge for environmental damage:** A standard recommendation of economists, perhaps, but one with great potential in East Asia. The use of prices, taxes and tradeable permits, promotes the most efficient and lowest cost solutions to environmental problems. Along with enforceable property rights, they provide the right incentives for the private sector to adopt cleaner technologies and abatement methods, while stimulating the search for better techniques. Further, charging the private sector for environmental damage could be a significant source of government revenue rather than a drain, and could be used to offset other taxes which do damage to the economy. When applied to public investments, charges can minimize the damage of

infrastructure investments and help in making the best public investments for reducing environmental damage.

A comprehensive system of charges cannot be implemented immediately. In support of the use of market-based instruments being advocated, three further directions for reform are suggested.

- **Set priorities and tackle the worst problems now:** Environmental agencies, already weak and underfunded, are overwhelmed by responsibility for too many problems at once. All environmental problems are not equal. Conditions that harm health and productivity the most should be addressed immediately. Solutions are readily available for some problems; reducing lead in gasoline and eliminating subsidies to logging and irrigation water are examples of measures that can be introduced right away.
- **Simplify policies:** Since it will take time to strengthen environmental administration, policies in the interim must be simple enough to implement easily. On this count, many taxes on inputs or products may be appropriate first steps. Even though they are not ideal from an environmental standpoint, they are a practical solution for limited administrative capacity. As institutional capacity and information availability improve, designs can be more sophisticated.
- **Collect and disseminate information and strengthen institutions:** Countries need to collect accurate information to reduce the uncertainty about how widely and how fast different forms of environmental damage are occurring. Making such environmental data available to the public would help in implementation by enlisting the support of local communities and environmental groups. Building up public sector institutions that are able to formulate and enforce environmental policies will reduce the costs of environmental protection over the long term by allowing the use of more sophisticated and targeted measures.

## II. The Environmental Challenge

The history of environmental regulation in OED countries shows clearly that higher incomes do not automatically lead to a clean environment. It is easy to be lulled into complacency by economic success. Though undeniably appealing, a strategy of “grow now, clean up later” would be dangerously shortsighted in East Asia. The lesson from industrialized countries is clear: Adopting preemptive policies now is much cheaper than waiting and paying the clean up costs later. And for forests and other vulnerable ecosystems, losses may be irreversible, because there may *be* no later.

### **Environmental Stresses**

The rapid growth in East Asia and the improvements in social welfare have been accompanied by increasing stresses on the environment - an undesirable side effect being felt

elsewhere in the developing world as well. But not all the news on the environment coming from East Asia is bad. Countries in the region have shown a concern for managing resources effectively and sustainably and for combating pollution to protect the health of their people. Consider the progress that has been made in two broad policy areas where many other developing countries are still lagging: reducing subsidies that encourage overuse and strengthening property rights.

Reducing subsidies to inputs and activities that contribute to pollution and the degradation of natural resource can contribute to environmental improvement by discouraging overuse. Subsidies on fertilizer and pesticides have been reduced substantially throughout the region in recent years. Indonesia, for example, has completely phased out what were once very high subsidies on chemical pesticides. There are also few, if any, remaining subsidies on energy inputs in the region (Table 1). This, too, is unusual in the developing world. Whether these trends - which have not yet taken hold as strongly in other developing regions - reflect a more heightened concern for the environment in East Asia or the shift toward greater reliance on market forces to set prices in the region, the effect is the same. Governments are receding as one of the principal causes of environmental problems through subsidies.

**Table 1: Countries in East Asia phased out most energy subsidies**

Country	Coal	Gasoline	Diesel	Kerosene	Electric power	Timber <sup>a</sup>	Irrigation water
China	0.4-1.0	0.6-1.3	0.5-1.4	-	-	-	0.53
Indonesia	-	1.7	0.9	0.7	0.9	0.2-0.33	0.5-0.6
Lao PDR	-	-	-	-	0.5	0.6	-
Malaysia	-	2.8	1.2	1.6	-	0.35-0.53 <sup>b</sup>	-
Philippines	-	2.6	1.7	1.7	1.2	-	0.81
Thailand	-	2.1	1.9	2.1	1.1	-	0
Viet Nam	-	1.0	1.1	1.1	0.6	-	-

Entries are the ratio of consumer to producer prices. Those less than one represent subsidies; those greater than one represent taxes.

- Not available.

<sup>a</sup> Proportion of rent captured by government as revenue.

<sup>b</sup> Sabah and Sarawak.

Source: Energy Detente (March 31, 1993); Asia Energy Profile (World Bank), 1993; Indonesia (World Bank), 1993a; 1993b; Malaysia (World Bank), 1991; Lao PDR (World Bank), 1993.

Clear and enforceable rights of ownership and use are essential if natural resources such as land and water are to be used sustainably. Many East Asian countries have taken steps to strengthen property rights to both rural and urban land. Recent initiatives in Thailand, the Philippines, and Indonesia are laying the foundation for legally enforceable property rights. These steps have included cadastral surveys and establishment and implementation of land tilting procedures and regulations.

Most East Asian countries have also recognized the need to adopt policies aimed specifically at mitigating environmental problems. They have instituted laws and regulations and often modeled on those in OECD countries; many have established specialized regulatory institutions. Typically, ministry-level institutions have been established to oversee environmental

protection, although forestry is often managed by a separate agency. Controls or standards applicable to pollutants or natural resource extraction have been emphasized. To control vehicle emissions, for example, the main focus has been on standards for cleaner fuels and engines. These environmental protection laws have generally been ambitious with stringent targets for ambient environmental quality and for control of discharges or resource use.

But two factors make the case in environmental degradation in East Asia more severe than that it was for today's industrialized countries earlier in their development. First, the population densities of most East Asian countries are far higher. For instance, Java's population density of more than 800 people per square kilometer is higher than it was (and is) in Japan or Belgium. Similarly, the largest cities in the region are more populous than were those in Europe and North America. By 2000, for example, it is estimated that 7 of the 21 megacities of the world (with populations exceeding 10 million) will be in East Asia. Hence pollution and congestion affect more people in East Asia than they did in industrialized countries. In addition, East Asia's environmental problems are occurring at much lower per capita incomes than was the case for industrial countries. In part, this is because of the unprecedented rate of recent economic growth in much of East Asia. In the 1980s, for instance, per capita incomes in East Asia grew more than 6 percent a year, almost six times faster than in OECD economies between 1913 and 1950. Per capita GDP doubled in just a decade in Korea (between 1966-77) and China (1977-87), and in 8 years in Thailand (1986-93), whereas it took thirty-four years in Japan at the turn of the century.

The greater complexity of manufacturing products and processes today compared with fifty years ago intensifies these impacts. Much of the growth in the chemicals industry, a major contributor to all forms of industrial pollution, has occurred mainly in the postwar period at a time when per capita incomes in most industrialized countries were already higher than those in much of East Asia today. Complex industrial pollution problems are intensifying in many East Asian countries, which are hard-pressed to develop and implement ameliorative policies because of the many other unaddressed environmental issues associated with their relative lack of development. For example, despite improvements in the last three decades, much of East Asia's population -- particularly the poor -- still lacks access to safe water and sanitation facilities. And the extraction and use of natural resources, from soils and forests to groundwater, still exceed sustainable levels in many countries.

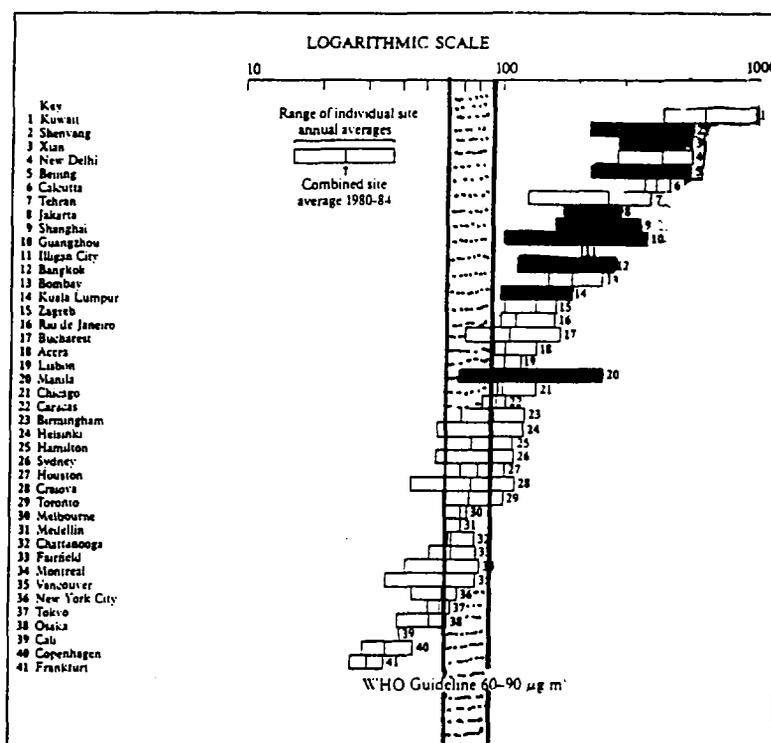
### **Development at Risk**

If unchecked, the pace of environmental damage from pollution and overextraction of renewable natural resources threatens to compromise the welfare gains in East Asia from higher incomes. And progress in East Asia has been slower than its rapid income growth alone would suggest, since a clean and safe environment is an important part of the quality of life -- a large, yet often unmeasured component of welfare.

In most East Asian cities, untreated industrial and human wastes pollute surface water and groundwater. In Jakarta, unsafe water imposes annual costs of more than \$300 million solely from additional deaths from diarrhea, costs that are borne almost entirely by the poor (Indonesia 1993c). Nine of fifteen cities with the highest levels of suspended particulate matter (SPM) are in East Asia (figure 1). Most recent Bank analyses, using somewhat different approaches to measuring the monetary costs of SPM and lead, found that:

- ◆ In *Bangkok*, reducing the levels of SPM and lead in the air by 20 percent would yield annual benefits of \$700 million to \$3 billion.
- ◆ In *Jakarta*, these two pollutants lead to health costs totaling \$100 million to \$455 million a year.
- ◆ In *Kuala Lumpur*, reducing SPM and lead levels to standards of the OECD countries would result in health improvements valued at about \$1.2 billion annually.

Although there is much uncertainty about the specific numbers, each of these costs represents a significant share of the income of the city concerned -- generally about 10 percent (Thailand 1994; Indonesia 1993b; Malaysia 1993).



Source: WHO and UNEP 1987.

Note: East Asian developing countries shaded.

Figure 1: Nine of fifteen cities with the highest levels of suspended particulate matter in East Asia

Almost all East Asian cities (except those in China) suffer from chronic traffic congestion, a consequence of increasing demand for transport, especially private vehicles, as societies become more urbanized. Traffic congestion not only fouls the air, but also imposes a direct economic cost in productive time lost as people sit longer in their cars on their daily commute to work. Reducing

the number of peak-hour trips by 10 percent in Bangkok would yield an estimated \$400 million annually in time savings for the remaining travelers. The growth in automobile ownership and energy use in East Asia has been rapid and is likely to continue as incomes rise. Unless sound policy decisions are made quickly, urban air pollution and congestion are likely to become much worse (Figures 2 and 3).

Figure 2: Energy consumption closely follows economic growth

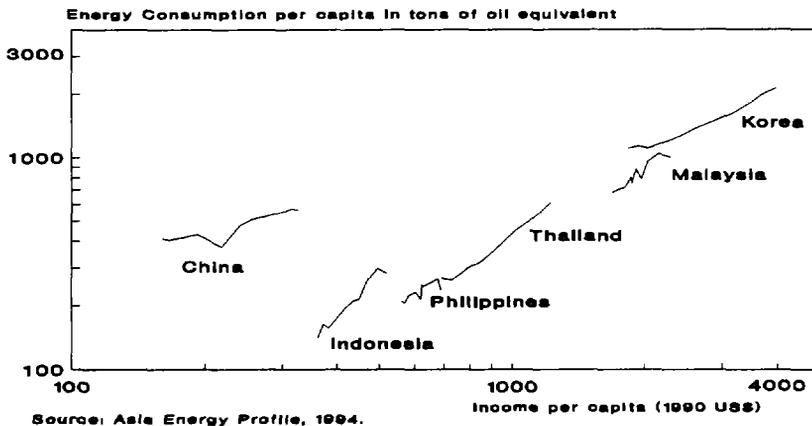
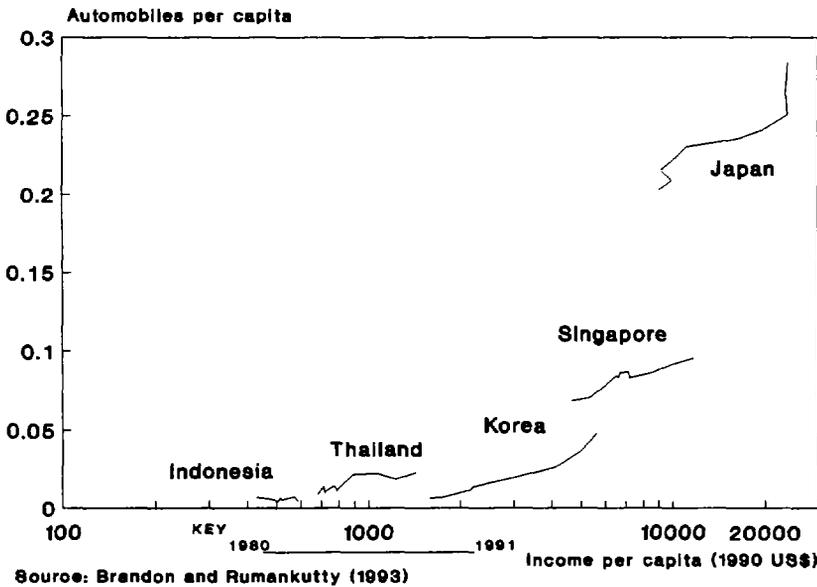


Figure 3: ... as does car ownership

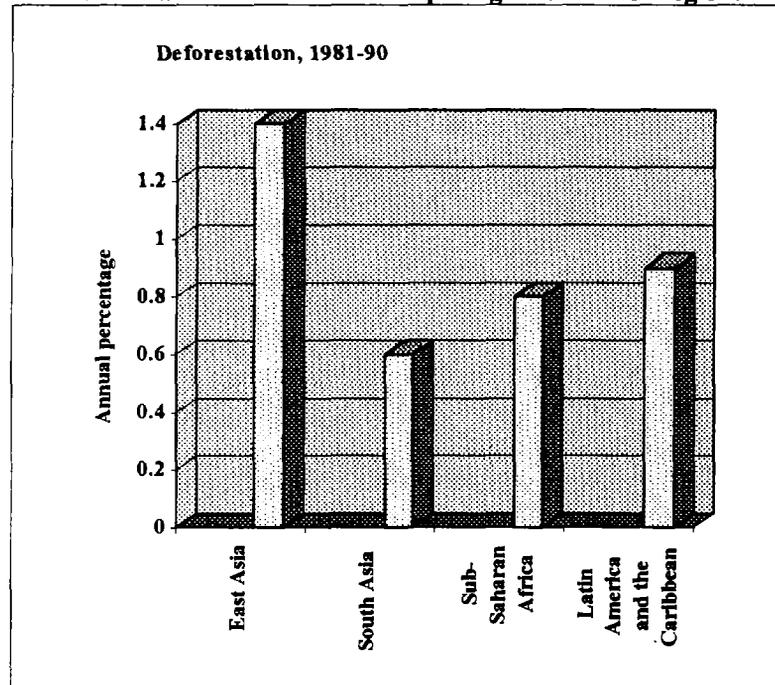


Managing such natural resources as soils, forests, and water remains another formidable challenge. Most countries in the region have been spectacularly successful in increasing food production: cereals production has almost quadrupled since 1960. With most (almost 95 percent) of the gains coming from higher yields (rather than expansion of cultivated area). Yields per hectare, on average, are now the highest in the developing world and almost equal to those in OECD countries.

But with intensification has come excessive use of pesticides and fertilizers. And soil erosion, reflecting in part the deforestation of watersheds, is becoming a drag on output growth. In Java, for example, soil erosion led to productivity losses estimated at \$300 million for 1989 with up to \$100 million in additional losses due to off-site effects of siltation. And in the Philippines, annual losses from soil erosion on grasslands alone are estimated at more than \$100 million. In East Asia as a whole, about 20 percent of all vegetated land suffers soil degradation from erosion, waterlogging and overgrazing all occurring at rates higher than the worldwide average.

Stagnant yields and increasing pressure on agricultural lands (in part from the pace of urbanization) mean that more forests and coastal wetlands are being used for short-term production, a use that is likely to take a heavy toll over the long term. Deforestation is occurring faster in East Asia than anywhere else in the world (figure 4). In Indonesia, a major cause of deforestation is conversion of forests to agriculture by small holders. But the wider benefits -- in the long-term and right now -- of maintaining these forests often far exceeds their value as agricultural land. A recent study estimates that, even without timber extraction, the largest tract of mangrove forests in Irian Jaya provides economic benefits, through fisheries and soil protection, of about \$40 million (Indonesia 1993b). Thus the losses from the extensive deforestation in much of the region have been substantial. In the Philippines, it is estimated that almost 90 percent of the productive old-growth forests have been lost since the 1960s, a casualty of excessive logging, both licensed and illegal (Philippines 1989).

**Figure 4: Deforestation in East Asia is outpacing that in other regions**



Source: World Bank, "Sustaining Rapid development in East Asia and the Pacific," 1993

### III. The Source of the Problem

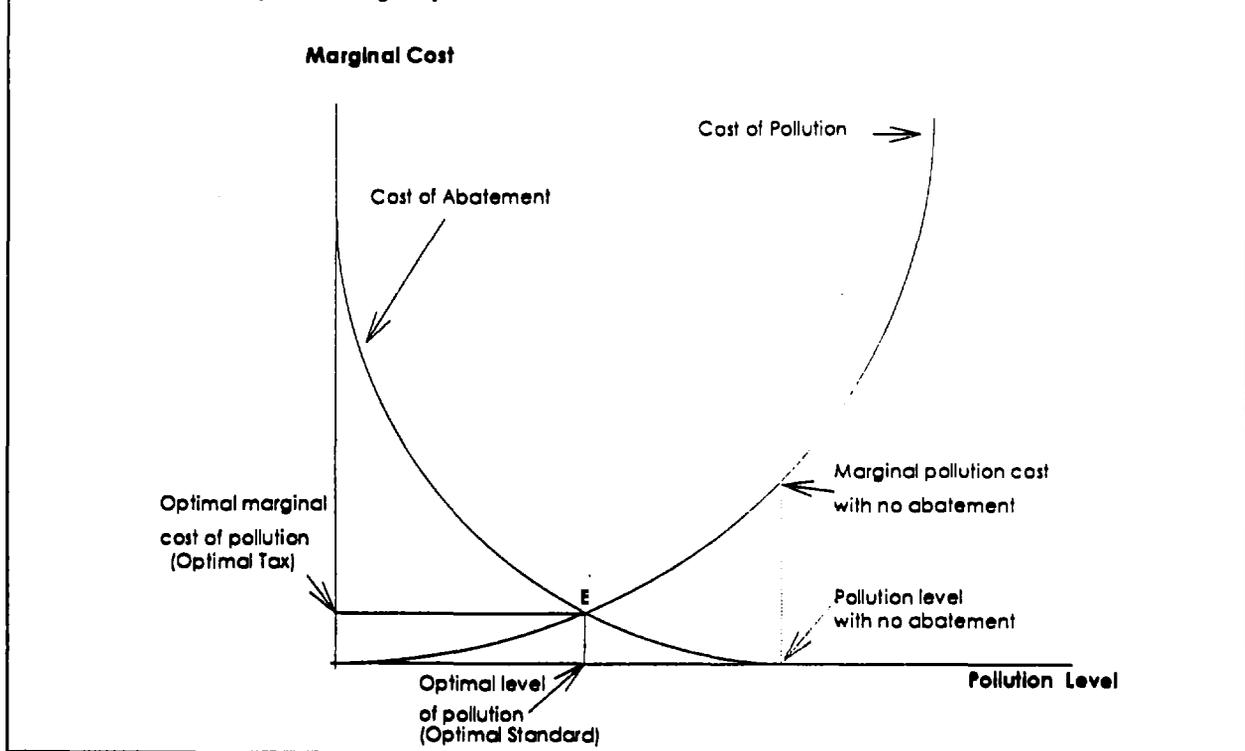
In the developing and the industrialized world, environmental damage -- whether air and water pollution or destruction of forests, continue to occur largely because people do not have to pay for the damage their actions impose on others. For most products, markets provide a natural mechanism for balancing benefits and costs because these are measured accurately. But the benefits from environmental protection - and the costs of environmental damage are usually not captured in the workings of markets. Some environmental benefits, such as those associated with clean air and water cannot be traded because it is virtually impossible to establish ownership rights to the resources. In other instances, as with tropical forests, only some uses can be traded (timber, for example) and are therefore valued in markets, while other uses, which may be more valuable, such as the watershed protection, are not marketed. The result is too much timber extraction and too little forest cover.

Because of the difference between social and private costs - the negative externality - markets alone do not ensure sound decisions, and that is why excessive environmental degradation occurs. Industrial producers will pollute unless they are compelled to pay for their fouling of air and water. Consumers will use their cars without concern for emissions unless required to pay for the effects of those emissions. Foresters will extract timber beyond socially desirable levels unless they are made to pay the full cost due to losses of biodiversity and amenity value and increases in greenhouse gases.

**Box 1: The cost of reducing pollution -- and of failing to reduce pollution**

The best environmental management will not eliminate all pollution. Rather, it will balance the damage caused by pollution with the costs required to control it. In the figure below, the horizontal axis shows levels of pollution (or deforestation) and the vertical axis shows two types of cost. The upward sloping curve shows the marginal costs of the pollution itself -- in impaired health, more discomfort, or loss of the aesthetic value of an environment that has been degraded. The downward-sloping curve represents the marginal costs of reducing pollution, including the direct cost of abatement equipment, the possible loss of efficiency when production techniques change to reduce pollution, extra transport costs of pollution-intensive firms relocated away from population centers, and loss of profits when products that are more profitable and more polluting more are replaced by those that are less profitable and less polluting.

Abatement costs fall with higher levels of pollution. In the absence of any policy on abatement, firms will have no incentive to incur abatement costs and pollution will be where abatement costs are zero. The social costs of pollution are quite high, and it is worthwhile to reduce pollution. Under optimal policies, pollution will fall until the cost of pollution just matches the cost of abatement (corresponding to point E). Note that neither the level of pollution nor the cost incurred from pollution is zero when the best policies are pursued. The marginal costs from pollution are equal to the cost (represented by the abatement cost curve) of reducing the pollution.



The problem hints at the solution. Some outside influence, whether government rules or social pressure, is required to get these costs incorporated into producers' and consumers' decisions. Knowledge of cleaner techniques of production or waste disposal is not enough. Unless there is a penalty for the damage pollution causes, it is still cheaper to pollute than to clean up.

Sometimes the people who are directly hurt by environmental damage can force polluters and society to value the environment correctly by mounting legal challenges or exerting direct pressure on firms and governments. But the kinds of problems for which popular pressure is effective tend to be limited to obvious and visible ones, typically involving single large polluters. Beyond these limited areas, governments must take steps to ensure that businesses, consumers, and their own agencies take the real costs of environmental damage into account in making decisions (Box 1). Disclosure, accountability, and competition in bidding for government licenses can do

much to prevent decisions that worsen pollution. So can greater public participation in government decisionmaking on environmental policy and on public investment plans and pollution sources in their area.<sup>1</sup> The formulation of phasing of such measures are the concern of much of this paper. But, first, it is useful to dispel some misconceptions about the causes of environmental problems and to examine why current policies are not working well.

### **Why Growth is not the Problem**

Attributing environmental problems to the failure to incorporate social costs into private and public decisions is at odds with a popular alternative explanation, which blames the rapid economic growth of the last few decades. Though many forms of environmental damage in the region have worsened, rapid growth is not the underlying cause. Rapid growth accelerates urbanization and industrialization, and the associated increasing demands on air, water, transport, and energy could worsen many types of pollution and congestion, if no corrective action is taken. But low-growth countries experience similar difficulties. For example, per capita incomes have stagnated during the past decade in Manila, which has almost the same environmental problems as Bangkok, where per capita incomes have grown at a brisk 5 percent a year. In both cities, the highest-priority pollution problems are high concentrations of suspended particulate matter and lead in the air and microbiological contamination of water.

Slowing economic growth is not the solution. The challenge is to sustain growth while mitigating its harmful environmental impacts. Higher incomes and faster growth offer an opportunity to solve many environmental problems:

- ◆ Higher incomes mean that more funds are available for investing in environmental infrastructure, such as sewerage and water supply facilities. Higher incomes also work in favor of environmental improvements by increasing the demand for a better environment.
- ◆ Faster growth rates mean faster turnover in manufacturing plant and equipment, providing more opportunities to replace older, polluting technologies with cleaner alternatives. It is estimated that by 2020 in Indonesia less than 8% of industrial output will come from establishments that existed in 1990.
- ◆ The virtuous circle between economic growth and environmental quality extends even further. Many policies that promote economic growth are also environmentally sound.

Openness to international trade and investment, a notable feature of the high-growth East Asian economies, has environmental as well as economic advantages. Recent research (Wheeler et al. 1993) shows that the more open economies have most rapidly adopted clean manufacturing technologies often to meet environmental standards in industrial countries. The adoption of environmental technology, though not motivated specifically by environmental concerns, occurs because openness to ideas and technology is an important correlate to openness in trade.

### **Governments Can Make Things Better -- or Worse**

Governments everywhere, despite having the power to correct some of the wrong signals of the price system often make them worse. Three common problems of omission and commission are:

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<sup>1</sup> Huq and Wheeler (1993), Ostrom (1990).

- Subsidies to polluting activities.
- Lack of clarity in defining and enforcing property rights.
- Failure to consider environmental impacts in evaluating public investments and regulating the private sector.

*Subsidies.* Developing countries frequently subsidize inputs such as electric power, fuel, irrigation water, and pesticides and activities such as commercial logging, providing further inducement to overuse polluting inputs or to expand the damaging activities excessively. Correcting subsidy policies provides the greatest opportunity to advance environmental protection while also increasing economic efficiency.

Subsidies to electric power and energy consumption are not as widespread in East Asia as they are elsewhere in the developing world (See Table 1). China, the third largest energy user in the world has removed most subsidies on coal and petroleum products. Most petroleum products and about 80 percent of coal are now sold at decontrolled prices. (Up from 50 percent at the end of 1991.)

The remaining subsidies on fuel do not always show up in aggregate statistics. One reason is the cross-subsidizing of one fuel at the expense of another. For example, in the Philippines, policies that mandate the use of domestic coal in the same proportion as imported coal subsidize domestic coal which has a higher ash and sulfur content. Switching to cheaper and cleaner imported coal would reduce production costs by about 10 percent for coal-fired power plants and by about 15 percent for cement plants, translating into annual savings of about \$10 million. The plants' emissions of SPM would fall by about a third, and their sulfur dioxide discharges would be cut in half. Indonesia also retains subsidy components for diesel and kerosene in its pricing structure. Although these subsidies are sometimes justified on income distribution grounds, in fact they do not benefit the poor more than others while encouraging overuse by all consumers.

The most common subsidies still in place in East Asia are the underpricing of water and standing timber. Water charges for irrigation are seldom collected and rarely set close to the long-run marginal costs of provision. The overuse of irrigation water leads to salinization of soils and, by depleting groundwater, to land subsidence. Improper pricing not only means that more valuable uses of water are forgone, but also that this critical resource is being depleted.

In many East Asian countries with the largest forest resources, fees for harvesting timber on public lands are very low. As little as one-third of the value of standing timber is typically recovered by government from private developers in Indonesia, Malaysia, and the Philippines. Much of the world's remaining rain forest is in Southeast Asia, so these implicit subsidies to deforestation are cause for urgent attention by the nations themselves and by the international community in providing assistance.

*Property Rights.* In all areas of natural resource management, there is a positive correlation between tenurial rights -- whether through direct ownership, stable share-cropping arrangements, or long-term use rights -- and investments in conservation. This relation has been shown to hold historically and worldwide and in well-defined systems with communal ownership. In China, unsustainable forestry practices for obtaining fuelwood and building materials can be

directly linked to the lack of clear property rights. In Indonesia and Malaysia, encroachment by illegal loggers and conflicts over the use of public lands are also a product of unclear or unenforced property rights. Thailand has made significant progress in managing the environment by strengthening the definition and administration of land titling.

*Charging for environmental costs.* But even more important in East Asia than removing subsidies and enforcing property rights is to go the extra step of demanding that users pay the full social costs of the goods and resources they consume. The polluter pays principle is now generally accepted, but its most common interpretation -- that the resource user (or polluter) must bear the cost of environmental cleanup (or pollution reduction) -- is inadequate. A more direct way to link payments to incentives to conserve the environment would be to tax pollution or resource use according to the environmental damage that results. Businesses, farmers, and consumers can be expected to invest in controlling environmental damage when that is cheaper than paying a charge for damage caused.

Governments are also part of the problem when they omit environmental costs from their investment evaluation procedures. Government projects should not be exempt from the requirement to include full cost of environmental effects in calculations of social profitability. Taking these costs into account would show that some investments are not justified on economic grounds. This can be done-- and is being done increasingly -- through the regular use of environmental assessments.

*The way forward.* East Asia has made great progress in opening its economies to trade, removing subsidies and promoting education and population programs. Both growth and the environment should benefit. Future reform should emphasize:

- Removing the few remaining subsidies that are harmful to the environment.
- Clarifying tenurial laws and establishing clear property rights.
- Charging for environmental damage.

The rest of this paper focuses on how to implement the third principle after explaining why the present system needs to change.

### **Why the Current Approach is not Working**

Most current environmental policies do not apply the principle of charging for environmental damage. The regulatory measures that have been preferred through much of East Asia and the rest of the developing world have not worked well. And often, where pollution has been reduced, the cost has been high. There are plenty of laws on the books in East Asia to address environmental issues, but many are misguided and overreactive. Most laws are based on OECD models that set ambitious goals for pollutants and environmental indicators, and rely primarily on source-specific standards. But experience in environmental policymaking over the past three decades in OECD countries shows that these laws can be costly. The cost of environmental regulation is particularly relevant in East Asia, where despite the recent rapid growth, many social needs still remain unaddressed.

Three main problems weaken the efficacy of policies for environmental protection in East Asia.

- ◆ First, many laws are simply inappropriate. Like their OECD models, these regulations are expensive to implement and administratively demanding. These policies usually take the form of physical standards (rather than charges) that governments impose on the emissions, inputs or technological processes of polluters and natural resource users (command and control policies). The information needed to set standards is often unavailable so that standards are often inappropriate. If enforced, such policies would impose unnecessarily high costs.

**Box 2. The high cost of inappropriate environmental protection policies.**

The Philippines sets standards for allowable levels of biological oxygen demand discharges. To be cost-effective, these policies should result in unit abatement costs that are the same for all firms, thereby achieving a given aggregate level of pollution control at the lowest cost. Yet the top 100 water-polluting firms in metropolitan Manila face a range of marginal costs in reducing these discharges (See box table.) The ratio of the highest to lowest treatment costs is more than 5 to 1. In other words, a better policy could achieve the same amount of pollution control at a possible savings in total abatement costs of almost 50 percent. Examples of the higher costs associated with using command-and-control measures for environmental management can also be seen in industrial countries that have relied extensively on such measures. In the United States, the ratio in incremental costs for control of sulfur dioxide emissions from different sources is as much as 100 to 1.

**Differences in treatment costs for top 100 water-polluting industrial firms, Metro Manila**

Subsector	Firms	Estimated BOD discharges (KG/day)	Average Additional Treatment Cost (/kg)
Slaughterhouses	11	48,783	4.56
Tanneries	2	8,425	4.73
Beverages	8	20,027	6.83
Electronics	1	564	-
Laundries	2	3,279	7.35
Chemicals	9	12,267	7.69
Dyes and textiles	13	17,520	9.05
Metalworking	4	2,029	13.55
Pharmaceuticals	3	1,244	15.41
Pulp and paper	3	1,350	22.90

- Not applicable.

Source: Based on World Bank/UNDP (1992) and cited in Philippines, 1993.

- ◆ Second, many laws are enforced weakly, if at all, so compliance by businesses and individuals is generally poor. Sophisticated and costly monitoring requirements remain beyond the financial and technical capabilities of most environmental regulatory agencies in East Asia, despite their best efforts. The widespread noncompliance that results signals not only the failure to curb even the most serious forms of environmental deterioration, but also a loss of credibility for government regulatory authority and commitment to achieving environmental goals.
- ◆ Third, environmental protection agencies simply have too many things on their plate to be able to handle them well. The simultaneous need to address both the unfinished agenda in basic sanitation and the newly emerging problems of

industrial societies has overwhelmed governments. Many have tried to address problems that are of little urgency to them while severe problems go unchecked. Although there is no evidence of damage from acid rain in Indonesia, for example, the country has set more stringent standards for sulfur dioxide emissions than has the United States. The incremental costs for power plants of meeting the standards are estimated to be as high as 17-20 percent of the total cost of power generation -- with no discernible benefits (Indonesia 1993b). This failure to focus on the issues that really matter has also contributed to the problem of weak enforcement. These problems demonstrate the need for less costly and more effective ways to address environmental degradation in East Asia.

### **Obstacles to Using Charges**

The principle of charging for environmental costs is well known. Yet despite the apparent simplicity of this underlying principle of environmental management, few serious attempts to implement the market-based measures it implies. Command and control policies still dominate. If this principle is so compelling, the obvious question is why is it so rarely followed in practice, even in industrial countries? For East Asia, three explanations seem relevant: political opposition, little experience in industrial countries, and the special problems of formerly socialist countries, where the market system is still developing.

*Political opposition.* The "right" to pollute and to extract natural resources at will are far better established in most of East Asia than the public's "right" to a clean environment and sustainable use of resources. As a result, political will is often lacking to challenge the status quo that favors polluting industries, subsidized and inefficient state-run utilities, or firms benefiting from underpriced publicly-managed forests. Introducing new taxes is always a contentious business and government promises of tax relief on other activities may not be credible. Energy-intensive and polluting industries (especially those that would be subject to expensive clean-up requirements) can be expected to strongly oppose taxes. Forestry interests also often lobby strongly against laws on illegal logging and the recovery of rents on timber. Water rights and prices are politically potent issues everywhere. Conflicts between farmers and urban or industrial users of water have punctuated much of the history of the western United States. Consumers also resist paying full cost for such utilities as water and electricity, let alone extra levies for the environment. They come to view subsidized prices as entitlements.

The strong political opposition that would be mounted against efficient and environmentally sound policies should not be underestimated. But if a country is serious about protecting its people from the harmful effects of environmental degradation, these parochial interests need to be engaged forthrightly. The alternative is (and has often been) to adopt halfway measures based on specific technical fixes that obscure the intent, motives, and especially the costs of bad environmental policy rather than making the case for environmental protection openly. Deceiving the public is a poor basis for policy.

*Lack of Experience.* Although market-based instruments are increasingly being used in East Asia and throughout the world, they are still relatively untested. Government officials are understandably reluctant to experiment with them. Still, where just a few years ago it was difficult

to find good examples of market-based instruments, today there are a variety of such instruments in use in the region and internationally (Box 3).

### Box 3: Examples of market-based environmental policies

The longest standing tax-based pollution control program in the region is in Japan. Since 1974, victims of pollution-induced diseases have been compensated under the Pollution-Related Health Damage Compensation Law through a tax on polluters. After certification that their ailments are due to air pollution (chronic bronchitis, bronchial asthma, asthmatic bronchitis, and pulmonary emphysema) or water pollution (Minamata disease, Itai-itai disease, and chronic arsenic poisoning), victims are entitled to such benefits as wage compensation and free medical care. In 1992, compensation totaled 96 billion yen for 90,000 victims (over \$10,000 per victim). The program is funded by charges on polluters based on emissions. Payments for smoke, soot, and sulfur oxide emissions of commercial facilities make up 80 percent of the fund, and an automobile tonnage tax, make up the rest of it. This levy has been credited with stimulating the search for cleaner fuels and technology and for smaller fuel-efficient cars.<sup>a</sup>

China has also had a long-standing system of charges on effluents. The impact on pollution is hard to assess because for much of the time such charges were in effect, industries were not motivated primarily by profits. Currently, the levies are below the costs of pollution itself as well as its abatement. Also, the taxes are set on effluent levels above standards and not on the entire range. Firms have generally paid the taxes (which can be passed on to consumers) rather than seeking technologies to reduce the effluents and therefore the tax. In recent years, however, the budgets of firms have tightened, the rate of taxation on effluents has increased, and the potential of this instrument of policy has improved considerably. Research is underway to more carefully assess the impact on pollution. In 1989, the revenues generated by the tax added up to .1 percent (Y 1.4B) of GNP.

Malaysia has a more targeted form of effluent charges that focuses primarily on the largest polluters in the palm oil sector. A direct charge on effluents together with strict monitoring has brought down the water pollution load from the industry by a factor of 300 since the early 1980's. Wider application of the tax may be difficult, however, because monitoring would need to be extended to smaller factories, but the early success has been remarkable. There is also a system of "contravention licenses" with associated fees for firms whose pollution levels exceed established standards. These amount to effluent fees for levels above standard. In 1991, 153 such licenses were granted 40% to the food processing industry.

In the United States, the excessive costs of command and control regulation which imposed specific technologies on firms led to an innovative feature in the 1990 Clean Air Act. The overall goal was to reduce total sulfur dioxide emissions in half by the year 2000. Utilities and industrial sources received "allowances" to emit a certain amount of the pollutant in a given year. Firms that could reduce their emissions cheaply could sell the allowances to companies whose abatement costs were higher because of older technology or costlier inputs. The price of the allowance corresponds to the tax that would achieve the same degree of abatement. The estimated gain in adopting this strategy may be as high as \$1 billion a year. Achieving this maximum benefit has been hampered by uncertainty on the part of firms that individual states may impose a different system. There have been fewer trades of allowances between firms than expected. However, some analysts have noted that much pollution abatement can take place within firms with geographically dispersed plants and that a substantial portion of the anticipated benefits have been achieved with this intrafirm trading.

Germany's system covers a number of pollutants with charges dependent on their toxicity and their concentration in the discharge waters. It is a complex system, but the essential feature -- that it is always cheaper to reduce effluents below established standards than to bring them up to standards later -- is maintained. The system was phased in between 1981 and 1986 (charges per unit more than tripling in that time), and the period saw a related large increase in investment spending in pollution control.

<sup>a</sup>Tamura (1993).

But there is no lack of experience with command and control policies which, though successful in reducing pollution, have also led to much inefficiency and waste in achieving environmental goals. Rather than repeating the mistakes of the past, East Asian policy should be guided by the lessons learned and seek to apply the newer approaches.

*Transition Economies.* While market institutions are evolving rapidly in Asia's formerly socialist economies, some sectors are not yet far enough along to benefit fully from the introduction of market-based instruments. China (as well as the emerging economies of Cambodia, the Lao People's Democratic Republic, and Viet Nam) provides a particularly difficult case because the financial incentive to produce efficiently is not yet deeply ingrained in managers, so direct regulations may have to play a more prominent role for a while. China already has some pollution charges on the books, but they are weakly enforced and have not been very effective. The scope for taxation and tradable permits will increase and as liberalization proceeds in China, more firms become concerned with profits and losses. The government is increasingly worried about environmental problems and has recently developed a new master plan to address them, which estimates that the investment cost to retrofit factories (about \$35 billion) is several times larger than the total environmental budget for 1990-95 (\$14 billion). Charges to discourage environmentally harmful production must be a central part of the environmental strategy if it is to be successful.

#### **IV. Paths to Improved Policies**

In macroeconomic management, East Asian governments have demonstrated their ability to remain flexible while implementing clearcut policies. Similarly, in pollution control, they should experiment with policies and be willing to drop those that do not work or are too costly, while keeping in focus the principle of charging individuals, businesses and government for the environmental damage they cause. Some policies can be implemented now, and the directions for the next steps can be pointed out. At each stage, the demands that policies place on regulators should be consistent with their technical, financial, and institutional capabilities. For now, it is important to set priorities, use markets as much as possible, simplify the policy framework, evaluate public investments correctly and build institutional capacity, and collect relevant information.

##### **Set Priorities and Address Urgent Problems First**

The agenda is crowded, and doing too little and too much can both lead to error. Although not enough is known to specify priorities precisely, countries must make a start. Priorities need to be set in light of the costs and benefits to society of achieving different degrees of environmental improvement.

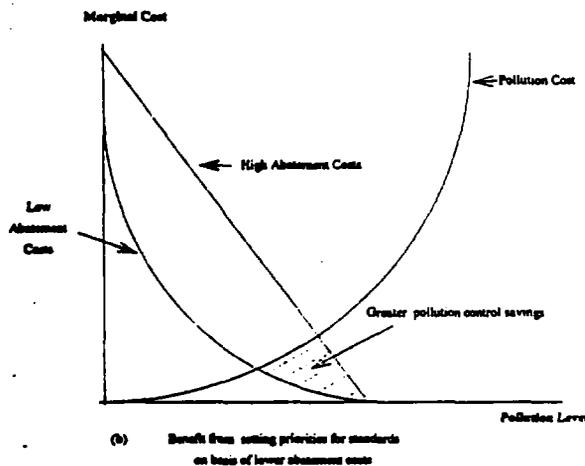
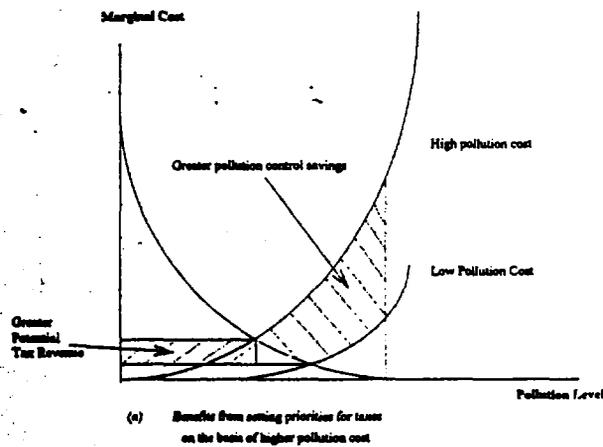
Policymakers sometimes believe that there is a single "right" standard (one at which negative effects are negligible) for each pollutant that holds across countries at all times, a view that has resulted in too much effort being spent on setting these standards in many East Asian cities. This view is not supported by the analytical work on the health and productivity effects of

pollutants, and it ignores the real resource costs of setting stringent ambient standards. More useful and realistic is to view ambient standards as goals with stringency increasing over time. With adequate information, setting priorities is not difficult, requiring only a comparison of benefits and costs (Box 4). But environmental data are generally incomplete, so uncertainty about costs and benefits is high. Recent World Bank reports give examples of the areas of prime concern for individual East Asian countries (Box 5).

**Box 4: Priorities for pollution control depend on the policies chosen and administrative capabilities.**

When the policy instrument is taxation, the highest-priority targets are, roughly speaking, pollutants with the highest marginal social costs. In the figure below, the benefits of taxation are divided into the gain in pollution reduction and the gain in tax revenue. For the same schedule of abatement costs, the gains from pollution control are higher for the pollutant with the higher marginal damage cost, and the extra revenue benefit is likely larger as well. The high-cost problems can be chosen without regard for the degree of pollution control possible in that industry. If the abatement schedule is flat (meaning that there are many opportunities for low-cost pollution abatement), the effect of taxation will be to reduce pollution without generating much revenue. If the schedule is steep (meaning that pollution control is difficult or expensive), taxation will raise revenues, as firms pay for the unavoidable damage they create, but doesn't reduce pollution much. Either way, high costs indicate a good target.

When standards are used, there are no revenue benefits and priorities should be based on the total social costs of pollution avoided--the size of the triangle representing pollution damage. Here, the shape of the abatement schedule is relevant, along with the pollution cost schedule, because the highest returns come from targeting the sources where reducing pollution is cheapest (the flattest abatement schedules).



**Box 5: Environmental priorities in selected East Asian countries**  
(as identified in recent World Bank Reports)

**China**

- Urban water quality
- Urban air quality (particulates and sulfur dioxide)
- Rural industrial pollution
- Rural drinking water

**Indonesia**

- Forestry management on outer islands

In urban areas:

- Water supply and sanitation
- Solid waste disposal
- Vehicle emissions (particulates and lead)

**Malaysia (urban only)**

- Transport-based air pollution (particulates and lead)
- Sanitation and water supply
- Traffic congestion

**Philippines (urban only)**

- Urban air quality (particulates and lead)
- Industrial and domestic water pollution (biological oxygen demand and total suspended solids)
- Heavy metals from gold mining

**Thailand (urban only)**

- Air pollution (particulates and lead)
- Water pollution (microbiological contaminants)
- Traffic congestion

Some environmental problems, such as global warming and ozone depletion, have international benefits as well as local ones. But from the perspective of national and local costs and benefits, these problems may not necessarily be of high priority. Hence, the international community might value protection of biodiversity or reductions in greenhouse gases more highly than do individual countries. If achieving higher standards means that a country would need to reduce its use of coal more than is in that country's best own interest, based on local and regional pollution impacts, then the international community needs to share the costs of this added burden. Multilateral institutions can act as a broker between international and national interests as the recent proposals concerning the Global Environmental Facility illustrate.

Some problems are so clear a threat as to warrant immediate attention regardless of what regulatory, pricing, or permit systems put in place to deal with them. Much miscommunication between economists and technical specialists can be attributed to differences in their approaches to these problems. Technical specialists ask whether it is worth spending time and resources on finding the right level of charges when the technical solution is known. For the small number of serious environmental problems that already present a clear and present danger. Their view is correct.

Leaded gasoline is an example. In Thailand, lead pollution, mainly from leaded gasoline, has resulted in an estimated 4-point drop in children's IQs. Whether leaded gasoline is banned outright or subject to a high tax makes little difference since the appropriate tax is likely to be so high (relative to the benefits of using lead to enhance octane) as to have the same effect as a ban. For example, calculations for Malaysia show that the tax on leaded gasoline would need to be fully 80 percent of its current price in order to cover the cost of the health effects of lead. In Indonesia, the tax would have to be about 33 percent. At these tax rates, there should be virtually no demand for leaded gasoline since unleaded gasoline, which is a very close substitute, is only slightly more expensive at world prices. The shift to unleaded gasoline (production or imports) would need to be phased in, and for reasons of administrative simplicity, regulations rather than taxes are the preferred way to phase out the use of lead.

Coal is another example, particularly the use of low-quality coal and lignite for power generation in populated areas. Calculations incorporating the health damages attributable to coal in Indonesia and Thailand lead to implicit costs for coal that are much higher than its market prices -- so much higher, in fact, that using coal is unlikely to be efficient in most cases. In Jakarta, for example, the implicit tax needed to cover the cost of the health effects of coal at current levels of pollution would be 70 to 80 percent of the price of coal. China suffers similar problems from coal-burning power plants. Because most of the coal is used in a relatively small number of power and manufacturing plants, it may not really matter much for now whether the problem is handled through direct control or through higher prices. In the case of coal, solutions of current problems need to be integrated with longer-term strategies. Managers considering the siting of new power plants, for example, should be facing the right prices. Coal presents less of a problem in areas remote from population centers and this difference should be reflected in the price of coal, so that decisions are consistent with a country's overall pollution control strategy.

The same is true for two-stroke motorcycles. Much of the air pollution in the major cities in Indonesia can be traced to small (two-stroke) motorcycles and old, ill-maintained "clunkers" (Indonesia 1993a). Again, the choice of policy instrument makes little difference. Improved inspection standards (though with attention to the abuse of discretionary enforcement), bans on smaller motorcycles, or high taxes at the time of purchase are all acceptable options. It is

estimated that Jakarta's air pollution suspended particulate matter from mobile sources can be cut in half through such changes. The problem of two-stroke engines also plagues Bangkok and will likely soon affect the formerly-socialist economies of East Asia.

Sometimes pollution sources are so concentrated that it is easy to address the main offenders through specific measures without worrying about how to integrate these measures into a comprehensive pollution control strategy. For example, in metropolitan Manila, 80 percent of the air pollution comes from just four sources (three power stations and a wood-fired plant -- Table 3). As administrative systems develop, it may be possible to cover the other 20 percent as well, but there is no reason not to target the top four (or even the top thirteen ) right now.

**Table 3 : Concentration of stationary air pollution sources in metropolitan Manila**

*Note: A 1992 survey shows that 4 polluters account for over 80 percent of pollution (the Sucat, Manila, and Rockwell power stations, and a wood-fired Proctor & Gamble plant.*

	<b>Total Soluble Participates</b>	<b>Sulfur Oxides</b>	<b>Nitrogen Oxides</b>
<b>Including power generation:</b>			
Sources responsible for 100% of emissions	162	162	162
Sources responsible for 90% of emissions	13	3	12
Sources responsible for 80% of emissions	4	2	3
<b>Excluding power generation:</b>			
Sources responsible for 80% of emissions	28	33	48
Cutoff emissions level (tons per year) <sup>a</sup>	15	50	9

<sup>a</sup> Sources producing less than this level do not fall in the group of sources responsible for 80 percent of emissions.

Source: Cited in Philippines (1993).

### Use Markets More

Implementing comprehensive social cost pricing will take time . Administrative capacity has to develop and information on emissions and costs needs to be refined. But there is no reason to postpone introducing better prices, even as currently estimated. One way to incorporate environmental impacts into the decisions of businesses and individuals is through the tax system. Ideally, environmental taxes or charges would be levied directly on the damage that results from the pollution or natural resource exploitation. But, it is often easier administratively to levy the tax on the use of polluting inputs such as diesel or coal or to link it to the scale of the damaging activity, such as the volume of time extracted.

A system of tradable permits has advantages similar to those of environmental charges or taxes. The government auctions rights to pollute or to use natural resources which frees it of the requirement to find the right "price" for the taxes (although it has to find the right quantity to offer at auction). The United States has successfully used tradable permits for controlling sulfur dioxide and lead and for managing forest tracts and offshore oil exploration.

Any measure will be difficult to impose without social consensus. Using taxes or tradable permits do have some political advantages despite their obvious limited use to date. Their revenue potential may sway ministries of finance or local governments. And, by permitting other taxes to be lowered (on income, profits, wages, imports and exports), a pollution tax allows other industrial groups and consumers to share the benefits of pollution control, which should generate some support for new environmental taxes. Public education is critical. The point should be made clearly that taxes will always be necessary, and that the advantage of pollution taxes over other taxes is that they bring in revenue and improve efficiency and social welfare.

Taxes on effluents and natural resources are important potential sources of local and national revenue. Often, though, the taxes are imposed to fund environmental protection agencies or other earmarked environmental efforts, with tax rates too low to have much of an effect on emissions. Pollution taxes or systems of tradable permits need to be designed to let producers know clearly the costs that their activities impose on others, to provide incentives for using less damaging technologies and searching for new ones. And if the taxes do not lead to abatement efforts because it is more expensive to reduce pollution than to pollute (as reflected in the pollution taxes), there is a silver lining: the taxes will generate more revenue.

The revenue potential of these taxes is very large. Though precise estimates require much information that is not easily available, preliminary estimates were prepared for several East Asian countries:

- For Indonesia, it is estimated that taxes on gasoline equivalent to the marginal health costs of pollution in Jakarta could generate as much as 4 percent of total government revenue. That is enough revenue to enable the government to replace some of the most distortionary features of its tax structure. If the government's rent capture on forestry products were increased from the present very low 30 percent to its full potential, revenues equivalent to an additional 8 to 12 percent of total government revenue would be generated.
- In Malaysia, doubling the price of gasoline and diesel fuel, an increase commensurate with the estimated health costs associated with the use of these fuels, would raise revenues equivalent to about 10 percent of current government's expenditure. Improving the government rent capture on forestry products from its current 70 percent could yield revenues equivalent to as much as 3 percent of government revenue.
- In Thailand, taxing coal and lignite to cover the associated health costs in populous areas would make their use uneconomic and so would generate no revenue. A 10 percent tax on the coal and lignite used in manufacturing (a small fraction of total

use and an equally small fraction of the estimated health costs however, would yield a return of 1 to 2 percent of government revenue.

It is important to emphasize, though, that the purpose of pollution taxes is not to raise revenue, but to internalize the costs of pollution and to lead to gains in efficiency. If producers can find ways to avoid paying the tax by reducing emissions or by conserving on resources, so much the better. Thus government planners need to recognize that taxes collected for environmental protection may be temporary. They should resist the temptation to maintain taxes on proxies for environmental damage (such as those on fuels) that generate revenue, but are not efficient once improved means of taxing emissions are developed.

Of even greater importance is the potential for efficiency gains from these taxes. Revenues from pollution taxes allow governments to eliminate more common, distortionary forms of taxation. Income taxes, sales taxes, wage taxes, and trade taxes impose substantial losses on national economies in the form of reductions in the labor supply and in the consumption of goods and services caused by distorted incentives. Estimates of this loss in the United States range from 10 cents per dollar of revenue collected to as much as \$3 with most estimates in the 20 cents to 50 cents range.<sup>2</sup> There are few studies for developing countries, but one study<sup>3</sup> for India estimated that for each rupee collected in tax, more than 1.1 rupees were lost to the economy.

Calculations for Indonesia, Malaysia, and Thailand, using conservative estimates for the loss to society from common taxes, show that the savings from reducing distortionary taxes may be as high as the welfare gain in reduced pollution. An estimate for Indonesia indicated that imposing a \$10 per ton<sup>4</sup> tax on carbon and reducing corporate income tax to a level that keeps revenue unchanged (\$260 million) resulted in a net benefit to society of \$23 million a year. The government's ability to generate revenue by correcting a distortion rather than by creating one is a powerful additional argument for tax-based instruments, (Box 6).

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<sup>2</sup> Browning (1987).

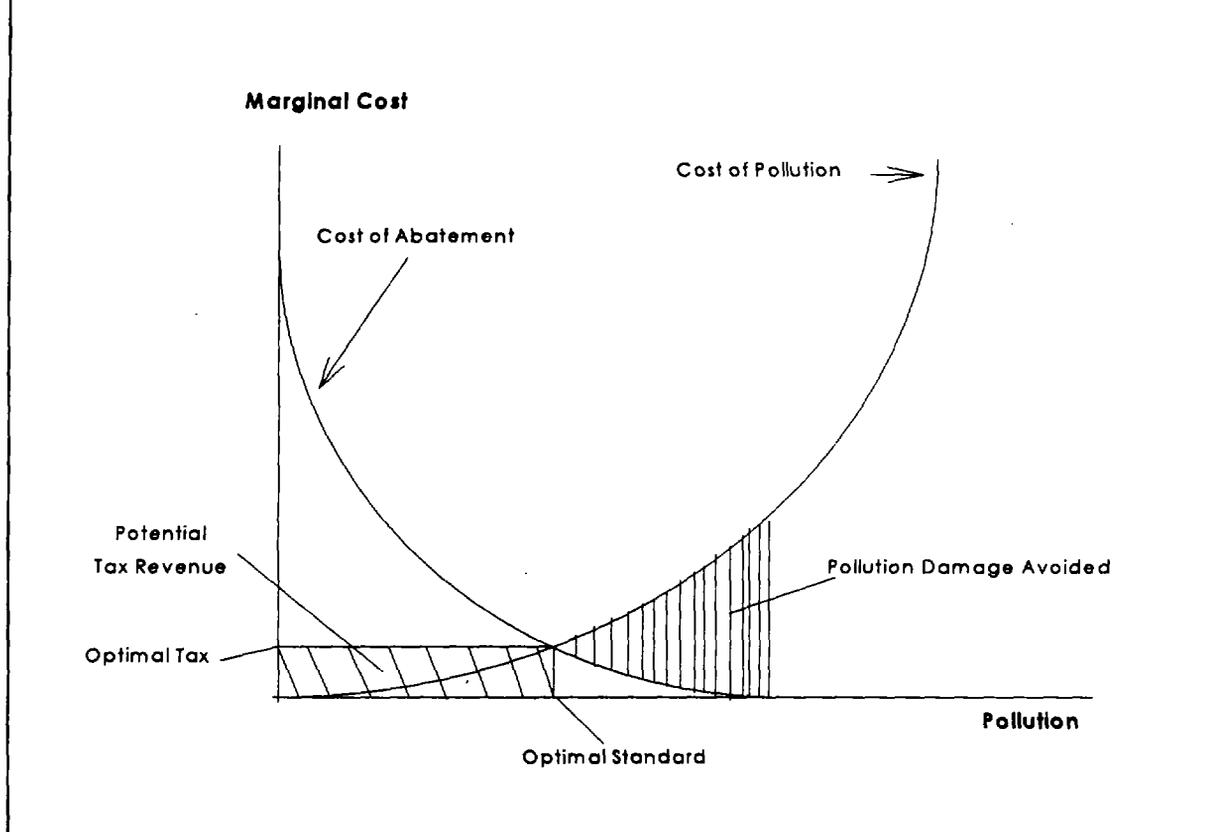
<sup>3</sup> Ahmad and Stern (1987).

<sup>4</sup> Shah and Larsen (1992).

**Box 6: Pollution taxes or standards – who gets the benefits?**

Taxing pollution can generate revenues for government which imposing standards cannot. Using the diagram introduced in Box 1, one contrast between taxing pollution and setting standards can be clearly shown. Either policy instrument can be used to attain the 'right' level of pollution -- directly through imposed standards or indirectly through a tax. The direct gain in both cases is represented by the triangle marked 'costs of pollution.' The difference is in who gets what revenues in the process. Under standards, firms would be restricted to the optimal level of pollution but not have to pay anything for the pollution they are generating up to that standard. In this sense they would be *subsidized* for the pollution they create up to that point. Under taxation, the revenue generated, equal to the rectangle marked 'potential revenue', accrues to the government.

If this tax revenue can offset other taxes, there can be a further benefit to the economy. Income, wage, trade and poverty taxes are very damaging to national economies. The benefit for replacing some of these other taxes with revenues from pollution taxes can be a substantial fraction of the direct gain from pollution reduction.



The direct economic costs of implementing these policies would be modest if they were targeted at addressing the most urgent problems. In metropolitan Manila, for example, a program aimed at mitigating the highest priority problems of airborne particulates and lead and discharges of industrial wastes -- involves compliance costs to businesses and consumers estimated at about \$70 million annually and administrative costs to the government of an additional \$15 million. In Thailand, a similar program that will also target sulfur dioxide emissions from power plants in the

Northern Region is estimated to impose incremental compliance costs of about \$190 million annually (or about 0.25 percent of GDP).

### **Simplify Policies**

Whether for monitoring compliance with emission standards or for assessing pollution charges, measurements are needed of the plant-specific effluents of the pollutant being controlled. The same holds for measures to control exploitation of natural resources. The task is daunting because pollution sources and resource users are so numerous. Thus the demands on the government's monitoring and auditing ability for administering a system of effluent charges and tradable permits are similar to those for standards regulation.

Because environmental institutions in Asia and elsewhere are still administratively and politically weak and short of funding and adequately trained staff, in some cases, it may make sense to select simpler alternatives rather than the otherwise preferred approach. In controlling industrial pollution, for example, administrative capabilities may need to be strengthened before environmental agencies are able to use sophisticated systems of environmental damage charges that require measuring actual emissions from different sources. Monitoring vehicle emissions is even more difficult because the number of sources is larger and vehicle inspection systems are rudimentary at best. In these circumstances, it may be preferable to levy differential taxes on polluting inputs (fuels) or on final products (chemicals, for instance) because they are easier to administer than charges for emissions. In controlling natural resource use, similar difficulties arise, for example. It is usually impossible to charge loggers according to the value of timber they extract from publicly owned forests because of the difficulties of accurately measuring that value. It may be easier to use proxies for environmental damage that are easily calculated, such as the size and location of concessions.

One way to reduce the administrative burden of monitoring individual firms is to be selective in the choice of targets. Concentrating on the biggest targets can go a long way since a large fraction of total pollution is often attributable to a few sources. (See Table 3). The risk in this approach is that large firms, which may be efficient in production, may be unduly penalized by selective environmental policies, creating perverse incentives for keeping manufacturing or processing firms inefficiently small.

A second strategy for reducing administrative costs is to establish a system of "presumptive charges." For industrial pollution, charges are not levied on firms on the basis of their actual emissions but of a "presumed" level of emissions that depend on easier-to-monitor characteristics such as product mix and level of output of the plant. The system assumes that no abatement activities are in place other than some minimum required treatment level. Rebates are provided firms that can prove that their discharges were below the presumed level, thereby providing an incentive for firms to clean up discharges and adopt cleaner technologies. The burden of monitoring is shifted to the firm. A standard auditing system is needed to discourage fraud. This system retains the advantage of more a sophisticated pollution tax if the level of taxation varies according to local conditions, providing an incentive to move production to less vulnerable locations.

Ideal policies for assessing ambient pollution loads and determining appropriate charges may be neither possible nor necessary. It may be enough to establish baseline ambient levels for

many pollutants and to use continual monitoring as a relatively inexpensive way of picking up trends and changes. On the more difficult issue of valuing the costs of pollution, there will be much “learning-by-doing.” No country has yet to come up with a completely satisfactory system.

But there is no reason to insist on perfection. In cities with the worst pollution, the actual cost of some forms of pollution is so high that it may not be feasible to impose taxes high enough to cover the cost. For Bangkok, for example, the appropriate tax on burning coal in the downtown area would be six or seven times the price of the coal. A smaller tax would signal to producers the government’s concern about polluting activities and should encourage abatement efforts. The tax rates can be refined as better measurements (of pollution levels and their costs) become available and as abatement activities are stepped up. As long as the rules are clear, companies and individuals can predict the long-run levels of taxes to factor these costs into their production, abatement, and location decisions.

### **Evaluate Public Investments Correctly**

Like private manufacturers, industrial polluters, and household, governments must be forced to take account of the potential effects of their investment decisions on the environment. All investments decisions should be evaluated in terms of the full benefits and costs they provide. When a public transport project is being considered, for example, the direct pollution expected should be considered, but so should the reductions in congestion and emissions achieved by displacing private cars. Similarly, for an electricity generation project, the costs of added air pollution should be assessed against the benefits of producing more electricity.

Public investment decisions will not always contribute to a cleaner environment. No matter how the East Asian economies meet their rapidly growing demand for electric power, there will be environmental impacts --fossil fuels will contribute to air pollution, dams will destroy some natural habitats, and nuclear wastes will need to be disposed of. But strategies to expand the power sector will need to ensure that the value of the electricity produced more than covers the investment, operating, and environmental costs of generating it.

Investments to meet the transport needs of East Asia’s growing urban centers and corridors will also incur environmental costs -- fuels will be burned, and open land will be converted to urban infrastructure. Such investments will improve national welfare as long as they show a good rate of return, environmental costs included. Environmental costs can be lowered by designing transport investments to reduce their pollution and congestion impacts. Pollution impacts can be controlled through the use of cleaner fuels and engines) and improved land use planning and public transport alternatives that reduce reliance on private transport. Congestion impacts can be reduced by building larger and better roads and by investments that direct transport demand toward modes such as buses and subways. Most governments in East Asia (with the notable exception of Singapore) have emphasized the supply-side response of increasing road space while neglecting road use charges and often measures to encourage alternatives to cars. But with congestion worsening in Bangkok, Manila, Jakarta, Kuala Lumpur, and even in the larger cities in China, the time has come to consider increased investments in public transport accompanied by policies to contain demand for private transport.

Large public investment are also needed in water supply, sanitation, and solid waste disposal. Demands on such infrastructure in urban areas is growing exponentially as East Asia’s

rapidly growing urban population approaches the rural population in size. For urban infrastructure, the main financial issues are pricing negative environmental impacts properly and increasing user charges to improve cost recovery. For some of these investments -- such as in safe water and sanitation -- a subsidy component is justified because of their positive external effects on health. Others should incorporate user charges to recover costs and reduce waste.

### **Build Institutional Capacity**

Environmental policies in any country require capable, market-oriented and flexible public institutions. In East Asia, political commitment to protecting the environment is on the rise, and now is the time to recast the region's fledgling environmental institutions into that mold.

In technical areas the greatest needs for capacity building are in analyzing policy at the national level, setting priorities and working with local communities. Decentralizing responsibility for monitoring and enforcement of urban environments and industrial pollution to the local level can be beneficial for the environment, but only if local agencies have adequate resources accountability, and central support. Similarly, decentralizing fiscal and planning authority for local infrastructure investments can bring public expenditures more in line with local environmental concerns.

The management of forests and other natural resources may be the highest priority for institutional capacity building. Policy and institutional requirements for natural resources management are probably more demanding than those for pollution management even though the capital requirements are lower. That is because the agenda in the natural resources sector is more complex (requiring a long-term financial and institutional commitment to introducing new production technologies under highly variable conditions) and more politically charged (because of rents, community conflicts over public lands and land tenure concerns). Sustainable policies will not be possible without strong political commitment.

High on this agenda are actions to slow deforestation. Doing so will require stronger legislation on land tenure and better enforcement. Other needed policy and regulatory reforms involve the proper valuation of forestry concessions, better management of public lands (especially forests), more attention to technical research and extension, and the introduction of programs in education, health, and population planning for rural populations to reduce migration and to provide options for managing resources with a longer-term perspective. Achieving these reforms will present a challenge to public institutions -- in agriculture, forestry, and irrigation that have not traditionally engaged in matters of strengthened property rights, long-term management, and technological innovation. These institutions need to be recast so that they become more responsive to the wider range of issues they face - simply expanding the powers will not do the job.

Some of the most pressing problems in forestry management occur in the poorer countries of Indochina. These nations, emerging from a socialist era, face serious problems of institutional development in all fields. The international community is making many new and unfamiliar claims on their environmental management, often on issues that have international, but little national or local benefits. Recent work has highlighted the difficulty of meeting these external claims (Laos 1993).

### **Collect and Disseminate Information**

After thirty years of concern for the environment in industrial countries, much of the basic information needed to make informed policy is still unknown. Considerable uncertainty remains about the consequences of different forms of pollution for health and other human and economic costs, the effect of deliberate policy initiatives on the level of pollution, and often even the pattern of pollution levels across regions and over time. Similarly, in many areas of Asia's remaining forests, the pace and extent of deforestation are known only vaguely; even less is known about the parameters of land degradation. There will never be enough information to make precise recommendations for fine-tuned environmental policies. Judgments nevertheless need to be made continuously, and as information accumulates, decisions can be improved.

One of the highest priorities for East Asian countries (and many international agencies can help on this score) is to put in place surveillance systems to monitor the environment. There is enough evidence on the danger of the pollution problem to warrant the effort. Ambient monitoring requires no cooperation from industry. Effluent information can be obtained from firms as a routine part of industrial data collection. Eventually such reporting by firms, subject to government audit, should be tied to systems of effluent charges. But the collection of information can begin before any effluent charges are imposed. Doing so would have the additional salutary effect of signaling to firms that governments are serious about enforcement.

Even basic data acts about environmental quality are often lacking. Water pollution in rivers is rarely monitored at different points along their course as they pass through urban areas. Systematic measuring of air pollution by site is more common, but frequently the gradations are not fine enough to be useful for policy. Industrial surveys (not tied to charges) could easily be amended to include information on waste generation or abatement effort. Governments should start collecting information on waste generation or abatement effort. Governments should start collecting information relating to the most serious health and resource degradation problems right away. This information is needed for *any* policy measure adopted. The costs of pollution vary with location, time of day and year, and population exposed, making many kinds of critical data hard to obtain. Work to fill some of these gaps in information has begun, but much more needs to be done.

Recent analyses by the World Bank have identified some key information needs. For Malaysia and Thailand, monitoring the quality of air and water is a high priority and should include the smallest airborne particulate matter and bacteriological assessments of water quality. For all the countries recently analyzed, information is lacking on the health costs of the main pollutants by country (and municipality). For assessing charges or setting standards, better estimates of the costs to society of pollution (and the way in which it varies by time of day and location) are critical.

Information should be made readily available to interested groups within each country. Public participation in industrial pollution control activities has proved cost-effective in several countries, and can help pollution monitoring and enforcement. Among interested groups that would benefit from information on environmental quality are business groups as well as the communities damaged by pollution. The same links between public bureaucracy and business in East Asia that helped bring economic success -- consultation, moral suasion, peer pressure, and cooperative decisionmaking (World Bank, 1993) -- can be brought into play in controlling

industrial pollution if information sharing is made an important feature in the government-business dialogue.

## **Conclusion**

Allowing environmental degradation to go unchecked in East Asia will lead to substantial losses in welfare. Whether in the form of pollution-induced diseases, stagnant agricultural productivity, or deforestation, these costs will erode the gains that East Asia has enjoyed from rapid economic growth. In several of the largest cities in East Asia, the costs are already large, and in many cities, residents suffer health and productivity losses equivalent to about 10 percent of their incomes.

But the case for decisive action to improve environmental conditions is even stronger. Addressing the most serious environmental threats in East Asia will in most cases, entail only modest economic and financial costs if cost-effective policies are applied (such as charges and tradable permits) and the political will can be summoned. And the benefits of these programs are estimated to be several times higher than their costs. How these benefits and costs are distributed will vary from country to country. But because the poor often live where pollution is worst and have few means of protecting themselves from the damage, corrective measures are further justified by the greater benefits they will bring to the poor.

The cost of doing nothing is enormous and will continue to rise with economic growth. The cost of taking action on the most urgent problems now is modest. Well-implemented measures to improve environmental conditions in East Asia have the potential to substantially improve the welfare of its citizens. While much will need to be learned along the way, governments can start right now to address the most pressing environmental threats and to put in place policies and institutions to improve the lives of their people. The East Asian countries have been the great innovators in designing successful economic policies. There is every reason to believe that they can apply the same ingenuity to the environmental challenges ahead.

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