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Industry and the Environment in Asia

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INTRODUCTION

In the past three decades, Asia has been through a remarkable transformation. Driven by rapid economic growth, the region includes countries which have now reached the standard of living enjoyed by the OECD economies, those that seem poised to follow shortly, and the remaining which hope to emulate the progress of the "East Asian Miracle." Yet the growth did not come without costs and the entirety of Asia is now plagued with serious environmental problems. This paper will explore the relationship between the emergence and growth of industry, and the deteriorating environment in Asia. Section one will provide an industrial overview of Asia and highlight the differences between countries and regions. Section two will consider the recent industrial growth and the current environmental condition and attempt to show the successes and failures of the variety of environmental routes followed across the area. This section will also consider the trends and factors that have led to either mitigated or exacerbated environmental degradation during industrialization. The third and final section will turn to the 1997 economic crisis and speculate as to the environmental implications this impact to the growth pattern route may cause.

ASIAN INDUSTRIAL PERFORMANCE

At the beginning of the 1990s, the Asia-Pacific Region contributed slightly more than 20 percent of the world's gross national product (GNP). World Bank projections indicate that the region will continue to grow more quickly than most others and that, by 2025, Asia's share of world GNP will have risen to 30 percent (Kato 1996). The primary source of this expected growth has been and will continue to be the expansion of manufacturing, as well as other types of industry.

The accuracy of such projections, however, has been put into question by the economic crisis and, for the short term, certainly, growth rates in the adversely affected economies are expected to be quite modest. However, the long-term outlook may not be dramatically altered. In the May 1998 World Economic Outlook, IMF staff predict a slow rebuilding of confidence during 1998, followed by a modest return of growth in 1999, and a solid recovery by 2000 (IMF 1998). Naturally, the predictions are based on the assumption that their recommended policies are followed. Provided that they hold true, long-term growth rates will possibly match the projections made in advance of the crisis.

While Asia as a whole has outperformed other regions, considering the continent as a single entity masks key differences between specific areas. Looking at the entirety of Asia, therefore, it is impossible to make generalizations about industrial performance. There is no blanket truth that would apply equally to each country. By considering the continent in four distinct regions, however, it is possible to make some general conclusions about each of them. To this end, the following section will consider Japan, East and Southeast Asia, South Asia and China.

Table 1 tracks gross domestic product (GDP) growth in these regions from the 1970s until the mid-1990s. GDP and MVA (manufacturing value added) figures represent the national currencies at 1990 prices and subsequently converted to US dollars at the 1990 value.

The industrial development of Japan in the years following the end of the Second World War can be considered in three stages that have dramatically changed its structure. In the first phase, which continued until the middle of the 1970s, Japan's impressive GDP growth rates, averaging nearly 10 percent annually, were driven by heavy industry. Food processing and light manufacturing, which had accounted for more than 60 percent of industry in 1955, were replaced by pollution intensive industries such as chemicals, oil and coal products, pulp and paper, and primary metals as the key industries by 1975. In the following decade, from 1975 through 1985, Japan moved away from the material and pollution intensive heavy industries and began to expand 'process' type industries such as electrical and electronics and transport equipment (O'Connor 1994). During the second phase, these process industries saw their

share of MVA rise from about 25 percent to nearly 40. These industries have continued to increase in importance in the third phase, which has continued up until the present time, and is distinguished from the second phase by falling oil prices and a rising yen. Recent events could signal the beginning of a new phase as the effects of a falling yen and severe depreciation of other Asian currencies on the structure of Japanese industry become clear.

In East and Southeast Asia, impressive GDP growth is visible throughout the measurement period shown in Table 1. Moreover, the growth has been dominated by the manufacturing sector. With a small number of exceptions, such as Hong Kong, which has become a service and information-processing center, the manufacturing sector is the driving force of the economies of the region. This region actually includes two sub-groups that have followed somewhat different time-frames for development, if similar patterns. The Newly Industrialized Countries (NICs) of East Asia, along with Singapore, were the first to enjoy rapid increases in economic prosperity, and they have been followed by the ASEAN countries, excluding Singapore. For both groups, the original export-led development strategy relied on labor intensive and inexpensive products. With the emergence of industry in the ASEAN countries, and a new low wage competitor, the NICs have been forced to alter their strategies and are now producing goods from more capital intensive and heavier industries. Overall the industrial sector of East Asia has grown by more than 9.1 percent annually over the past 25 years (Kato 1996).

For South Asia, or the Indian Sub-Continent, the trend has been similar although less extreme. The industrial sector has grown at an annualized rate of 5.1 percent over the past quarter century, and has risen from 21 to 26 percent of GDP during that time (Kato 1996). As of 1994, food processing and textiles remained the largest manufacturing categories, with shares of total MVA at 10.3 and 14.5 percent respectively. Capital goods industries have also recently improved performance. The MVA growth rate for non-electrical machinery was 8.4 percent in 1994. Electrical machinery and transport equipment were rated at 6.5 percent and 6 percent (UNIDO 1995).

In China, the manufacturing sector's importance is more pronounced. In 1994, MVA held at 31 percent share of GDP and was continuing to grow at rates of nearly 15 percent. As this was moderately higher than the growth rate in the overall economy, the proportion of MVA will continue to increase. China's own strategy of export-driven growth, coupled with a transfer of labor intensive production from Taiwan and Hong Kong, has altered the composition of Chinese exports significantly. Whereas, manufactured goods represented approximately 50 percent of exports between 1985 and 1990, they had risen to over 80 percent by the mid-1990s (UNIDO 1995). The majority of these goods are labor intensive products. Nevertheless, the Chinese government plans to promote the machinery, electronics, automobile, petrochemical and construction industries as the basis for future industrial development, although these industries currently remain very much in infancy. As of 1994, textiles, industrial chemicals and non-electrical machinery were the three largest ISIC (International Standard Industrial Classification of All Economic Activities) manufacturing sectors (UNIDO 1995).

ASIAN ENVIRONMENTAL PERFORMANCE — GROW NOW, CLEAN LATER?

The performance of even the most miraculous of the Asian economies is tempered by a dismal environmental record, and the region is facing a wide range of environmental problems. While the economic growth rates achieved have never been matched, such rapid growth has also exacerbated the environmental difficulties, as regulators have had to deal with independent problems either simultaneously, or in rapid succession (O'Connor 1996). One illustration of the uniquely Asian dilemma is the task of coping with massive industrialization and an explosion in the use of personal automobiles concurrently.

Asia's most serious environmental problems are identified in Table 2.

As indicated by the array and severity of problems illustrated in Table 2, Asia's environment is in a woeful state. The important question is "how to minimize industrial pollution throughout production processing such that the net benefit (i.e., minus environmental costs) is maximized?" In one sense, it is not possible to desegregate the types of problems as the activities and harm caused by one issue tend to compound those of others. Nevertheless, there are three types of environmental problems which are more closely and specifically related to industrial development. From the table these include air and water pollution, as well as energy consumption. In addition, industrialization creates problems in terms of toxic and hazardous waste.

The growth of industry affects the pollution entering the environment in two distinct ways. The growth itself increases the total volume of pollutants released. This increase is inevitable in the short to medium term but can be overcome in the long term by choices affecting cleaner industries or cleaner technologies. An expanding industrial sector also tends to increase the pollution intensity of industry. In other words, the amount of pollution per unit of output increases

(Brandon and Ramankutty 1993).

Water Pollution

As reflected by Table 2, water pollution is generally recognized as the most serious environmental challenge facing Asia, both in terms of its current impact and its projected clean-up costs (Brandon and Ramankutty 1993). Three main factors lead to the water pollution: domestic sewage, industrial effluents, and run-off from activities such as agriculture and mining. Of the three, domestic sewage is the chief culprit. Nevertheless, there is variance between countries and regions. In China, suspended solids are the main concern, while in India it is faecal coliform counts. Southeast Asia suffers from elevated lead counts in the water, while in India and the rest of South Asia, nitrates are a more serious concern (ADB 1997).

Without proper enforcement of town planning in Asia, industries tend to locate both near urban centers and close to water (into which they discharge waste). In this case, industrialization compounds the problem of domestic sewage. This becomes more severe as industry shifts into high polluting activities such as chemicals, electronics, electroplating, and machinery. These types of activities create pollutants containing heavy metals and non-degradable hazardous waste and toxins that can lead to health problems for domestic water users. As the amount of such waste increases, groundwater contamination through leaching becomes a problem (Brandon and Ramankutty 1993).

Energy Consumption

It is not unusual for economic growth to be accompanied by an increase in energy consumption, but the Asian experience has been somewhat unique in the scope of the increased demand. Between 1975 and 1990, the developing Asian economies increased their share of world primary energy consumption from 8 percent to 15 percent (Ishiguro, Akiyama 1995). The industrial sector generally accounts for the highest share of final energy consumption. An exception is Thailand, where transportation holds the largest share.

Energy consumption affects the environment in a number of ways that make the growing consumption levels more worrying. Some East Asian countries are burdened by acid rain, owing largely to extensive coal burning in China (ADB 1997). Due to the abundance and low price of coal, however, the growing demand for electricity will likely be met chiefly by coal-fired power plants (Ishiguro, Akiyama 1995). Where hydroelectric power plants are used, the environment suffers as a result of the dam construction and community opposition often negates the option for nuclear power. Given these considerations, it is likely that the bulk of Asia's continued explosive demand for energy will be met with coal.

Air Pollution

This problem is strongly related to the energy consumption issue outlined above. The heavy reliance on coal causes tremendous air pollutants when available technological interventions (such as scrubbers) are not employed (Park 1996). In addition, coal mining results in problematic fly ash generation, especially in India. Sufficient accumulation of fly ash adds suspended particulate matter in the air and decreases overall air quality. The industrial contribution to air pollution in Asia is also heightened by the expansion of the iron, steel, fertilizer and cement industries.

Toxic and Hazardous Waste

One might expect that the NICs of East Asia would be the region's worst offenders of hazardous waste disposal. In fact, the creation of such waste tends to fall as incomes rise and China and India account for a nearly 100 million tons of toxic waste each year, much more per person than countries that have developed further (ADB 1997). Unfortunately, this relationship means that it is the countries least able to treat the waste who are also the ones faced with the problem. The result is that nearly three-quarters of Asia's toxic and hazardous waste is dumped into landfills or pumped into the ocean. The remaining quarter is treated chemically or incinerated, but often without adequate safeguards, if they exist at all (ADB 1997).

DOES ECONOMIC GROWTH OR INDUSTRIALIZATION IMPLY ENVIRONMENTAL DEGRADATION?

Too often, Asian development has followed the pattern established by earlier industrializing countries of sacrificing the environment in the early stages of growth with the belief that the depletion of natural resources and environmental degradation are a necessity for economic growth and that the mess can be cleaned up later. It has been proposed that any other development pattern would mean slower growth, but is this necessarily the case?

The most simple and empirical answer to this question is a resounding "no." For one reason, the environmental implications of the growth depend to a large extent on the basis for the growth. As a case in point, during the industrial boom occurring in Indonesia during the late 1980s, when the countries' overall national output doubled, the performance of the province of Bali was more remarkable still, tripling in industrial output. During the same time, while the country as a whole experienced environmental degradation, the adverse effects on the island province were negligible. Bali's growth was driven by export-oriented assembly which is much less pollution intensive than the manufacturing occurring elsewhere in the country (Afsah, Laplante, and Wheeler 1996).

This argument is somewhat misleading, however, as not every country or region can be a Bali. Someone must do the "heavy" and more pollution intense work that transforms raw materials into the products that can be used for the less polluting light manufacturing and assembly.

THE ENVIRONMENTAL KUZNET'S CURVE AND THE RELATIONSHIP BETWEEN GROWTH AND THE ENVIRONMENT

A growing body of research has attempted to identify and quantify the relationship between economic growth and adverse environmental consequences. The determined result is an inverted U-shaped curve, known as the environmental Kuznet's curve (EKC). The implication of the EKC is that in the economic development of a country, as per capita income begins to grow, there is a phase where the general state of the environment weakens, before it levels off and begins to improve as income grows further. The standard EKC is shown by the solid line in Figure 1.

At first glance, the relationship may appear puzzling. Why should early stages of economic growth impact the environment so adversely, and what causes the reversal as income levels rise? A number of changes that accompany economic growth may help to explain. First, in the agricultural sector, land use becomes more intense and an increasing number of pesticides and fertilizers are used, often without consideration of environmental consequences. The emergence of industry compounds the problem by adding to the already increased resource extraction process. In addition, industry contributes to increased levels and toxicity of waste materials.

With rising income levels, a number of changes account for the environmental improvement. First, there is a shift away from the heavy (and most pollution intensive) industries, and less demand on natural resources extraction. Cleaner industries and services employ a higher number of people. People's awareness of the environment also rises with income, and they may pressure the government to enforce protective laws more strictly. This enforcement is also made possible by the rising government budgets. Investment in adequate environmental infrastructure, such as proper sewage and transportation systems, is also more feasible (O'Connor 1996).

There are two other features of the curve that warrant comment. First, the horizontal line near the top of the curve illustrates that the eventual improvements to the environment with rising income levels may come too late, and that some of the damage done to in the waiting period may be irreversible. Second, the two dashed curves in Figure 1 are shown to illustrate that income is not the only factor that will influence the environmental picture as an economy develops. Government strategies, policies, and enforcement practices are more important in determining both the rate and extent of environmental damage.

But while the evidence suggests the existence of the EKC, it presents a danger in propagating the philosophy that growth first, followed by clean-up strategy, is inevitable. A secondary implication of this philosophy is that there is a trade-off such that concern for the environment will necessarily slow or impede economic development. In truth, the Asian experience refutes both of these theories. Looking at the high-performing Asian economies, O'Connor (1996) found that those who chose a more relatively clean path to industrialization did not grow at a slower rate than those pursuing growth at the expense of the environment. The question that remains unanswered is to what extent future growth will be slowed for those countries that have not protected their environments during development.

To illustrate the point, the growth patterns of Korea and Singapore can be compared and contrasted. Both countries enjoyed rapid economic growth over the same approximate time-frame but followed vastly different environmental strategies. In Singapore, environmental policy became thoroughly integrated with industrial policy by the late 1960s. Land use plans were designed and implemented to protect the water catchment area, and establish an industrial zone outside of that area. These plans have been supported by a strong regulatory framework and rigorous enforcement (US-AEP 1998b). Such policies have ensured Singapore's enjoyment of a protected environment during its rapid growth phase. By contrast, Korea's growth has led to severe environmental degradation. Minor laws were passed to protect the environment through the 1960s and 1970s, but there was no serious attempt to integrate environmental and industrial policies until the mid-1980s when the Constitution was amended to grant the right to a clean environment.

Its late start in environmental protection has led to a Korea with severe air pollution in cities and industrial areas, badly damaged rivers and streams, and soil polluted from acid rain, chemicals and chemical fertilizers (US-AEP 1998a). Sadly, too many Asian countries have followed the Korean path, and now face the same problems.

Returning to the EKC, while the curve may imply that with economic growth the environmental problems disappear naturally, the issue of causality is not explained. A study of the income environment relationship curve for a number of pollutants across many regions of varying income levels found that in general the shape of the curve supported the idea of an EKC (Islam 1997). The more important finding, however, was that there was a pronounced difference in the shapes of the curve between Asian and non-Asian cases, and a significant variance from one pollutant to the next. The implication of the result is that while there is an effect of income on the environment, it is only one of many factors at play, and may not be among the most critical. Nevertheless, it is roughly figured that the harmful effects of industrial pollution begin to subside when per capita incomes (adjusted for purchasing power parity) reach somewhere between US$5,000 and US$7,000 (Islam 1997; ADB 1997).

A DIFFERENT MODEL FOR ASIA?

As suggested above, the relationship between industry and the environment is noticeably different in Asia than is found in the development stages of other parts of the world, or for that matter in the history of the OECD countries. The following factors highlight advantages that Asia's environment has enjoyed.

- *Availability of clean technology:* This is simply a temporal factor. With the industrialization occurring later in Asia than it did for the Western economies, the benefits of improved technology were readily accessible. Instead of moving in step with industrialization, clean technology was available from the beginning. And, of course, the clean technology has emerged because of an overall increase in environmental awareness and consumer preference for cleaner goods.
- *Fast growth rates:* In general, the faster growing economies also enjoy faster turnover in manufacturing plants and equipment. This provides the opportunity to update polluting technologies with cleaner options (Hammer and Shetty 1995). The crisis, of course, means that these growth rates have slowed, and the environmental ramifications of this change could become an issue in the affected countries.
- *Open economies:* The reliance of the East and Southeast Asian economies on exports for growth has benefited the environment in at least four ways. First, the exports helped to create the high savings, a portion of which was used to finance the imported capital equipment, including the clean technology, discussed earlier. Second, to make the export strategy profitable, industry was forced to be cost-sensitive, with positive implications for materials and energy use. Third, the specialization that emerges from an open economy has led many of the economies to focus on the relatively cleaner labor intensive industries as opposed to capital or energy intensive ones. Finally, the reliance on exports has meant paying heed to the growing preference for environmentally friendly products by global consumers.
- *Energy policies:* As mentioned earlier, growing energy use is a severe problem in Asia. Too much of industry remains inefficient and wasteful. For example, for major industrial products such as iron and steel, cement, pulp and paper and fertilizer, energy requirements are 55 percent higher in China, and 50 percent higher in India per unit of output than they are in industrialized countries (Ishiguro and Akiyama 1995). For the more industrial advanced of East and Southeast Asia, however, progressive policies eliminating energy subsidies from heavy industry have served to protect the environment. Energy intensities of industry in the high-performing Asian economies are mere fractions of those of Eastern Europe, where energy subsidies have remained (O'Connor 1996). Moreover, less developed countries have made progress in achieving energy efficiency in the last decade since the mid-1980s (Brandon and Ramankutty 1993).

While a reading of the preceding section might indicate that Asia's environment should be relatively free of industrial pollutants, this is known to be untrue. The following section explains features of the Asian industrial growth model which have made environmental management difficult and exacerbated degradation.

- *Multiple problems occurring at once:* Industry is one of a number of factors that have created the environmental problems facing Asia. Poverty, population growth, urbanization, increasing popularity of personal vehicles, and excessive natural resource extraction do not exhaust the list problems. Some governments have managed to address individual elements, but tackling all the problems together has proven to be an impossible task. For instance, Taipei and Korea have seen rapidly escalating populations with minimal attributable environmental damage owing to policies fostering sustainable growth in agriculture and job creation in other sectors (ADB 1997).
- *Institutional failures:* There are at least three major problem groups combined under this broad heading and they

will be considered in turn. First, despite the existence of environmental legislation in every Asian country, the vast majority lack environmental institutions with the strength necessary to formulate, implement and enforce the policies necessary for true environmental protection (Brandon and Ramankutty 1993). Second, the local governments, which are by and large responsible for monitoring and enforcement, do not have the resources and skills necessary to adequately carry out the functions. Finally, the information that would be required for optimal environmental planning simply does not exist, leaving governments unaware of the effects of current pollution and possible solutions. Yet while the government institutions are not incapable of improving the situation on their own, they are equally hesitant to solicit support from the private sector, or the community in most cases.

- *Compressed time-frame:* The industrialization process in the Early Industrialized Countries (EICs) took centuries to achieve what has been done in the NICs in only a few decades. This, of course, puts an additional stress on the environment. The rapid progress also removes the possibility of seeing the consequences of one decision before it is time to make the next. Problems tend to pile up on top of each other; new ones emerge before the previous set has been dealt with adequately.
- *Change in output and consumption patterns:* Put simply, the goods that are produced and consumed today are generally manufactured by more pollution intensive industries than those of the EICs development phase. Consider, for example, the number of plastic and toxic substances used in industry today that were non-existent even in the recent past. EICs did not have to account for the non-biodegradable elements found today.
- *Moral hazard and the benefits of late abatement:* While there may not be a necessary link between industrialization and environmental degradation, in a rapidly growing economy there are factors at work that may discourage proactive environmental practices by industry. As pollution control technologies can be expected to improve over time, “late abaters” can expect both lower marginal costs for the technology and higher marginal benefits (O’Connor 1996). In other words, there is an incentive for industry to put off pollution control measures in expectation of paying less for it later on.

THE ENVIRONMENTAL IMPLICATIONS OF THE FINANCIAL CRISIS

The extent of the economic crisis indicates that the Asia that emerges will be recognizably different from the Asia beset. There are fears that some of the short-term effects of the economic crisis will be environmentally harmful in the countries most adversely affected. Remembering Table 2, deforestation is among the most serious and most pervasive environmental problems in the region. The fear is that as the new unemployed return to their traditional rural homes and agricultural practices, the problem will be compounded yet again (The Economist 1998).

In the hardest hit economies, it is also expected that government and private initiatives for environmental spending will be curtailed in the short term. In Thailand, for instance, the budget for environmental infrastructure was slashed by a third by the Office for Environmental Policy and Planning in the wake of the crisis (The Region in Crisis 1988). The cut is typical of the response of governments across the region. While aid supplied for environmental projects is not expected to decline, and may increase in local currency terms, there are fears that much of this money could be delayed by state agencies suffering from liquidity crises. For these reasons, the short-term effects of the crisis on the environment should be expected to be negative.

On the other hand, there may be room for optimism in the longer term. As the economies recover and address the factors that led to the crisis, there will be spillover environmental benefits in several areas:

- *Transparency and Good Governance:* As evidenced by the changes of government in Thailand, Korea and Indonesia in the wake of the crisis, it is apparent that the public demand for improved government performance is on the increase. Pressure for more responsible and responsive government will not subside after the economies have healed. In conjunction with the heightened environmental awareness of the public at large, the result will be a cleaner environment.

In truth, the decisions of policy-makers and activities of enforcement agents will not be fully effective unless the general public continues the trend of consideration of the environment in their economic decisions. The lack of green consumerism in Asia has been a major contributor to the ongoing business and industrial degradation of the environment (Park 1996). Yet, this trend appears to be changing with the heightened awareness that individuals have of the environmental condition and consequences of inactivity.

A 1995 Gallup poll on public opinion concerning the seriousness of environmental problems, showed that people in developing countries were cognizant of the environmental problems in their local communities (43 percent of respondents cited poor water quality as very serious, and 35 percent had the same reply for poor air quality).

Moreover, higher percentages still saw these issues as being of serious concern in the world and matched in number the respondents from industrialized countries (DeShazo 1997). The heightened awareness of the environment in Asia may be attributable to the increase in press coverage, with articles on environmental issues more than doubling between 1986 and 1996 (DeShazo 1997).

- *Institutional failure:* In the years when the affected economies were enjoying rapid GDP growth, faith in the institutional framework of the countries was solid. The failures have shattered the faith and people will now scrutinize all aspects of government activity more closely, including environmental policies. In this sense, the crisis will have opened people's eyes to whatever may have been lacking in that area previously.
- *The return of foreign capital*: As the crisis eases and foreign capital returns to the affected countries, the decisions investors make will impact on development patterns. Research from the World Bank (Dasgupta et al. 1997) suggests that among developing countries in South America, and Southeast Asia, the shares of publicly traded companies are affected by environmental performance and reporting. Even in countries with lax environmental legislation and enforcement, the markets show a tendency to punish companies reporting harmful environmental practices and reward those that show heightened sensitivity to the environment and allow it to influence decisions. The authors do not argue that this relationship can replace positive state and community influence; nevertheless, their results indicate the value of collecting, analyzing and publishing timely and accurate environmental performance information. To the extent that environmental performance affects the markets, it can be expected that when the capital flows return to the battered economies of those stricken by the crisis, it will show a preference toward clean industries and environmentally sound companies.
- *Export reliance*: Just as the industrial growth of the affected countries was largely export driven, the speed of the recovery and the health of the economies emerging from it will also depend on exports. Owing to increased global preferences for cleaner goods, industries showing concern for the environment and evidencing this activity can expect performance benefits in export terms. With this in mind, there is further support for the theory that on the whole the crisis will be environmentally friendly for the region.

CONCLUSIONS

The Asian environment is being challenged by the triple threat of a large and growing population, massive urbanization, and rapid industrialization. The existence and interplay of these three factors will continue to provide environmental challenges to the region for the foreseeable future.

While the environmental performance on the whole for Asia has been poor, the damage that can be directly attributed to industry has been limited by a combination of proactive government policies and the availability of lessons and clean technology from countries having already industrialized. There is still much room to improve. The influence of markets and communities should be allowed to flourish. In the coming decades, the largest threat to Asia's environment as it relates to industry is the large and growing energy demands of the sector. Other areas also call for improved performance.

Currently, the most significant barrier to an improved Asian industrial relationship with the environment is the lack of accurate and comprehensive information. Many of the damage estimates and predictions for clean-up costs come from the World Bank's Industrial Pollution Projection System (IPPS), using pollution coefficients from the United States in 1988, and considered representative of the current Asian industrial state. The lack of data creates a host of problems for all affected parties. Citizens are unable to judge the risks facing them, policy-makers cannot devise optimal economic instruments nor create ideal legislation, and enforcement officers cannot distinguish the compliant from the heavy polluters.

Despite the overall malaise of the Asian environment, there have been significant policy innovations and positive steps made in the industrializing countries. Much of what is to come in the following years will depend to a large extent on how well the countries that are still developing, or have yet to develop, will learn and apply the lessons that East Asia offers.

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