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The Environment and Economic Growth: Harmony or Conflict?

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In recent years, international concern over the environment has grown to unprecedented levels, culminating in 1992 in Brazil with the United Nations Conference on Environment and Development. At this conference, more than 150 nations signed international agreements on the environment, ranging from the Biodiversity Treaty to the Framework Convention on Climate Change. Additionally, some nations have pledged that, by the year 2000, they will not exceed 1990 emission levels of the so-called "greenhouse gases," the atmospheric pollutants associated with global warming. Thailand has proven to be one of the most active developing countries in the international environmental arena, and is currently working to develop a national strategy to mitigate certain types of air pollution.

Beyond these specific agreements and pledges, the title of the United Nations conference suggests the focus of much ongoing debate: Are economic development and the environment fundamentally at odds, or can they co-exist more or less harmoniously? This debate continues in political, economic and scientific circles.

A prevailing belief is that technological and economic development will eventually bring a cleaner environment—that increasing industrial efficiency will lead to less pollution for a given level of economic output. By this reasoning, the challenge lies in assuring that the best and most appropriate technology is made widely available, so that all countries can follow a path of environmentally-sustainable growth.

The full picture is not nearly so clear. The growing body of scientific evidence may well lead to the opposite conclusion. Despite several clear areas of environmental success by industrialized nations, a broad range of environmental factors appear to be worsened by the industrialization process, despite the many technological advances of the past several decades.

And yet great international hope rests on the ability of industrial growth to raise the living standards of the world's vast numbers of impoverished people by creating the economic wealth necessary to provide such essentials as proper schools, homes, jobs and medical care.

Thailand now seeks to balance economic and social with environmental needs, and must make new compromises. The first step in reaching this balance is to acknowledge the conflict that exists, through a thorough look at available evidence. The second step is to develop an effective framework for reaching politically and financially feasible compromises.

This article presents a brief overview of relevant, newly-gathered scientific data confirming that a conflict does indeed exist between economic growth and certain environmental factors. The article then supports the use of economic valuation of environmental factors as a tool through which acceptable compromises can be achieved within an increasingly complex web of conflicting needs.

PREVAILING ASSUMPTIONS ABOUT THE ENVIRONMENT

Various articles and research papers have contributed to the belief that technological advances and economic development will lead to a clean environment. This line of reasoning is often cited by policy makers, and traces its foundations to various mainstream articles and academic research projects.

The controversial issue of economic growth's impact on pollution is addressed in a recent study by Gene

Grossman and Alan Krueger, two policy specialists at Princeton University. While focusing on Mexico and the environmental effects of the North American Free Trade Agreement (NAFTA), the authors conclude that, beyond the initial stages of national economic development, various environmental problems tend to be diminished through further economic growth.[1] According to the Grossman/Krueger study, countries tend to experience higher levels of airborne particulate and sulfur dioxide pollution as Gross Domestic Product (GDP) increases, until economic output reaches approximately US$5,000 per capita GDP per year, at which point airborne concentrations of these pollutants tend to decrease with further economic growth.[2] Proponents of both the NAFTA and the General Agreement on Tariffs and Trade (GATT) have cited the Grossman/Krueger study as evidence that free trade and growth hold potential benefits for the environment, beyond certain levels of development. Similarly, but from a different perspective, a 1992 article in *The Economist*, citing evidence from a recent World Bank report, summarized that "many of the policies that improve environmental quality will also strengthen development."[3] This article goes a step further than the Princeton paper by asserting that a division can be drawn between the local and global environments and that, in comparison to improvements in the local environment, "curbing global warming is a bad investment."[4]

While the limited scope of scientific data serving as the basis for these studies does not lend itself to the authors' broad conclusion that industrialization and economic development are generally "good" for the environment, the scientific analyses used appear thorough and balanced. The studies focus primarily on only a handful of pollutants and on the most pronounced urban environmental problems. While they may not reflect conditions for the world's vast rural populations, the studies are based on sound statistical data. Industrialized countries have indeed been able to solve or at least mitigate many environmental problems.

In the United States, for example, atmospheric lead concentrations, which are caused primarily by vehicle emissions, have fallen by over 90 percent in the past 20 years with the introduction of unleaded gasoline.[5] High atmospheric concentrations of lead, however, remain perhaps the greatest environmental danger to human health in many large cities in developing countries.[6] One study indicates that children who spend the first seven years of their lives in Bangkok may lose four or more IQ points due to elevated exposure to lead. This loss of intelligence, recent studies indicate, will persist throughout the lifetimes of the individuals affected and ultimately may inhibit productivity and lead to significant economic losses.[7] During adulthood, the consequences of elevated exposure to lead include increased risk of hypertension, heart failure and strokes. Clearly, developing countries stand to gain a great deal by emulating the successful lead emission reduction strategies of the West. In fact, unleaded gasoline has recently been introduced into Thailand.

Progress with atmospheric concentrations of particulate matter, a cause of respiratory disorders and cancer, has also been significant in many developed countries. This particulate matter is generally produced through the combustion of coal and wood products. Various technological advances have led to efficiency improvements in combustion processes and also to the development of emission control equipment, now widely used in the industrialized nations. Moreover, economic development tends to make available a wider variety of alternative fuels, such as oil and natural gas, that tend to produce less particulate matter when combusted.

The same trends help to explain why a reduction in sulfur dioxide (SO_2) emissions has occurred in developed countries over the past several decades. Sulfur dioxide, produced in abundance through the combustion of coal, causes various health problems and is also the primary cause of acid rain. SO_2 emissions through coal combustion can be mitigated substantially through the installation of pollution control equipment in factories and electrical power generators, and through the use of advanced methods of combustion that result in more efficient use of coal, and therefore less pollution. These advances and improvements, however, are quite expensive, and while many industrialized countries have invested heavily in these technologies, many less developed nations still find such investments either politically or financially infeasible.

A MORE COMPLETE ENVIRONMENTAL PICTURE

Improvements in all of these areas of environmental pollution are clearly desirable and commendable, but a study of only the environmental problems for which technology has offered solutions does not convey the full range of environmental challenges facing the world's nations. Studies outlining the positive effects of development on the environment are useful and important, but do not in themselves tell the full story.

Data Limitations

Much of the theorizing about the positive effects of economic development on environmental problems is based on data collected for urban areas only. For example, the United Nations' Global Environmental Monitoring System (GEMS), perhaps the most thorough international environmental data collection project undertaken to date, consists of atmospheric monitoring stations located in scores of cities throughout the world, and is the primary source of data for the Grossman/Krueger study discussed above. With only a limited number of monitoring locations in each city, the system is not capable of providing information regarding the effects of expanding urban development, or sources of pollution across an entire metropolitan area. At least two examples can be cited. Electrical power stations may be built farther from urban centers, thus dissipating the pollution stemming from increased urban activity. Additionally, the construction of highways connecting urban core areas to suburbs allows for more cars traveling greater distances each day. The effects of these trends cannot be monitored by stations left to measure atmospheric pollution at a single, fixed location. While the GEMS project is certainly a positive and useful step in building understanding of the global environment, the use of GEMS data to make broad-sweeping generalizations about national or global environmental trends is risky.

Some Disturbing Trends

As broader, nation-wide environmental information is gathered for various countries at varying levels of economic and industrial development, it appears that the process of industrialization leads to escalating output of certain substances, such as carbon dioxide, carbon monoxide and solid waste, which can have direct or indirect adverse effects on human health. Based on recently collected data, industrialized nations as well as developing countries have had a great deal of difficulty in preventing substantial increases in output of these and other pollutants as economic and population growth continues.

Global Concerns

Many environmentalists are most concerned about emissions of carbon dioxide, as this is the primary gas implicated in predictions of global warming. Global atmospheric concentrations of carbon dioxide have risen dramatically over the past 100 years, primarily through the combustion of fossil fuels and through deforestation. Climate change experts have reached a general consensus that this trend will cause the atmosphere to trap more of the heat energy radiated from the sun, thus leading to a warming of the global atmosphere—the so-called "greenhouse effect."

Figure 1 shows annual emissions of carbon dioxide versus Gross National Product (GNP) per capita for 26 nations over a wide range of economic output. Note the striking trend of rising carbon dioxide output as GNP per capita increases. The data used to generate the graph are the most up-to-date and detailed available and, except in the case of three nations, were submitted to the United Nations by each nation as part of their obligation as signatories to the Framework Convention on Climate Change. Data for the three exceptions—Brazil, Mexico and South Korea—were calculated by the Stockholm Environment Institute, an independent research foundation. These "middle income" countries were added to fill a gap in the income range of the countries which have thus far submitted their own emissions inventories to the United Nations. This helps to substantiate the trend shown in Figure 1.

As the United Nations emissions inventory process proceeds, calculations will be refined and many more countries will submit national data. Given the strength of the trend demonstrated with currently available information, however, the use of improved data in the future is not likely to change the obvious conclusion: Wealthy nations produce far more than their share of the world's carbon dioxide emissions.

Local Environment

Some quite reasonable skeptics would argue that this trend just does not matter, as carbon dioxide itself is relatively harmless to human health under most circumstances. Carbon dioxide emissions, while contributing to the potential for global warming, do not pose a substantial local environmental problem. Many policy makers, in an effort to refine decision-making and to hone policies, tend to distinguish between the global and local environment. Moreover, some investors and economists have embraced this distinction to discount concerns about global warming. These critics point out that considerable scientific uncertainty exists in predictions of global warming, and that the impacts of potential climate change are not likely to be felt for at least 50 years. By this time, so the argument goes, perhaps mankind will have developed new technologies and responses to the threat of global warming and climate change.

While such arguments by their basic nature are impossible to prove or disprove, the distinction between local and global environment is not necessarily a great boon to policy makers. According to a growing body of scientific data, economic growth appears tied not only to global environmental deterioration, but also to increases in several types of pollution acknowledged by even the staunchest skeptics as causing significant deterioration of the local environment, leading to well-established negative economic and social impacts.

Moreover, consensus among atmospheric scientists indicates that some pollutants that cause significant local environmental and health problems also contribute to potential global warming. Consequently, the distinction between local and global environments is ambiguous in some respects.

One pollutant hazardous to both the local and global environment is carbon monoxide, a gas produced in large quantities through the incomplete combustion of fossil fuels, such as in automobiles and some electrical power stations. Carbon monoxide, while acting as a significant threat to human health as a local atmospheric pollutant, also will eventually dissipate and react with other gases to form carbon dioxide, a relatively stable, long-lasting greenhouse gas, thus contributing to potential global warming. Figure 2, again based on calculations conducted by the Stockholm Environment Institute, shows annual national emissions of carbon monoxide versus GNP per capita for the same 26 countries that appeared in Figure 1. Note again the striking trend showing that wealthier nations tend to produce substantially larger per capita quantities of carbon monoxide than less-developed countries.

A positive correspondence between pollution and economic output is also shown in world production of solid waste generation, which industrialized countries again produce in larger quantities than the global average. While the physical and health-related impacts of solid waste production have been exaggerated by some environmentalists, the growing international political and economic concerns surrounding this issue, as well as some well-established health-related concerns, cannot be ignored. Nobody wants garbage in their backyard. Moreover, the pressures caused by lack of space for solid waste disposal can lead to waste incineration practices which can have adverse environmental effects.

The intention in discussing these pollution problems is not to isolate "guilty" nations, a tendency already straining relations between North and South, but to point out some environmental trends in the national progression from poor to rich, and to balance the popular belief that economic growth and technology alone can confront and solve the world's environmental problems. Inclusion of country names in Figure 1 and Figure 2 merely reflects an effort to explore fully the available scientific information regarding the environment. The trends outlined perhaps deflect any potential accusations of blame; though rich countries do indeed produce more than their per capita, global share of some pollutants, these countries should not be held as culprits simply because of their relative wealth. To do so would be tantamount to the equally unfair, reverse accusation that relatively poor countries should be held solely responsible for other, well-documented environmental transgressions simply because these nations are relatively poor. Rich nations tend to consume and spend more, and therefore produce larger quantities of some pollutants than poorer nations; poorer nations tend to rely more on unsustainable exploitation of forests and other natural resources to help generate much needed national income. In either case, these activities have significant impact on the local and global environment alike. The challenge is to develop a viable framework for compromise.

CONFLICT AND COMPROMISE

As global trade expands and countries become more economically inter-dependent and as populations continue to grow and demands on natural resources escalate, the scope of environmental factors considered will broaden and will become a source of increased political conflict. Though the conflict is likely to be manifested in countless forms, the fundamental question will remain the same: How can the social needs addressed through economic growth be balanced with environmental needs? Equitable and politically viable compromises can best be developed through a commonly accepted, methodical framework for conflict resolution.

One such framework gaining favor among policy makers involves economic valuation of environmental factors. Through consideration of various economic consequences related to a specific environmental factor, a monetary value can be placed on this factor.

A typical reforestation project serves as a clarifying example: The environmental damage caused by deforestation has been well documented. Many current reforestation projects in Thailand are helping to curb the vast loss of the nation's forest area that has taken place over the past 40 years. Many of these reforestation efforts require government subsidies, as these projects are not directly profitable for individual growers. And yet, the societal benefits of such projects are often manifold. As trees grow, they absorb airborne carbon dioxide, thus helping to refresh polluted air. Moreover, forest growth can help reduce soil erosion and silt build-up in water supplies, thus contributing to agricultural productivity and reducing flood hazards. By considering the economic implications of these benefits, as well as a wide variety of other factors—even including such factors as the price visitors are willing to pay to visit forest areas for recreational purposes—researchers can attribute a monetary value to forest growth. This value can be included in a comprehensive study of both the costs and the benefits of a reforestation project. By sorting out potential forestry projects to determine which ones are profitable and unprofitable in the long run, governments can optimize their investments, and can balance environmental, political and social goals more effectively through economic analysis.

Many environmentalists have also called for a rigorous system of natural resource accounting to be incorporated into national economic statistics. Under this proposal, nations would tally up the economic value of their various natural resource endowments, such as mineral deposits, fossil fuels and forests. Then, if a nation exports or otherwise expends natural resources without replenishing the original endowment, the nation must subtract the net loss in resources from the national accounts. In this manner the economic value of a nation's natural resource endowment can be monitored more thoroughly, just as a private company balances its account books according to the value of its capital investments. If a new international standard were established for national accounting, so that all countries worked on a "level" statistical playing field, unsustainable exploitation of natural resources would not lead to inflated economic output figures, which often serve to attract international investment. In this manner, countries would find new economic incentives to develop industries based less on natural resource depletion and more on other, perhaps healthier mechanisms for boosting economic output, such as human resource development and infrastructure development.

The concept of economic valuation of environmental factors is as complicated as it is flexible. The examples cited here serve as a brief overview of the potential benefits of this tool, but clearly these examples do not explore fully the innumerable potential applications. In fact, this flexibility is perhaps the tool's greatest asset.

CONCLUSIONS

To some, the idea of placing a monetary value on objects of intangible natural beauty—on forests, clean air, rivers—may seem crass or elusive. And yet, few if any better options appear more acceptable. Recent scientific evidence, as presented earlier, indicates that the industrialization process—the process so closely tied to improvements in quality of life in Thailand and scores of other nations—is in some respects inherently unsustainable, and will lead to escalating environmental deterioration in the years to come. A

compromise must somehow be reached.

When a government must, for example, weigh the benefits of the increase in income to its people from the construction of a new factory against the environmental degradation caused by that factory's pollution output, or when societies in general must make decisions about issues as wide-ranging as medical care, economic growth and environmental protection, economic valuation methods seem to be the best available tool for objective analysis.

Nowhere is the conflict between environment and economic growth clearer than in Thailand. Industrial growth here has been sustained in recent years at over 10 percent a year. At this growth rate, even with the best available technology, corresponding increases in industrial pollution are inevitable. Conversely, if emissions are to be held constant or reduced, this rate of growth cannot be sustained. Technology does indeed offer some answers and, in some respects, economic growth and the environment can flourish together. The larger environmental picture, however, is complicated by a broad range of unanswered challenges pertaining both to the local and global environments. If Thailand is to achieve substantial environmental improvements, environmental issues must be considered as part of the same analytical framework associated with other economic and social decision making, with a view toward the needs of future, as well as present, generations.
