

## Solving the Riddle of Development

*An Economist's View*

**BY GRACIELA  
CHICHILNISKY**

All over the globe, developing countries are caught in an ever-tightening spiral of ecological destruction that is one of the most urgent environmental problems of our time. These nations are mining their minerals, cutting and burning their forests, extracting their oil, and shipping out raw or nearly raw materials to the developed countries as fast as they can—often squandering resources that could be better used domestically—in a losing race for export revenues and foreign capital to industrialize and to pay off their enormous debts. In the process, environmental costs are ignored, and catastrophic environmental damage is commonplace. Yet this pathological path of development is precisely the one recommended by traditional economic thought.

How is this possible? Do economic principles truly dictate that developing countries must destroy their environments? More fundamentally: Is there a contradiction between economic gain and environmental preservation? The answer to this question is a resounding no. The truth—and the path to a stronger, healthier pattern of development—lies in a new analysis of the economics of industrialization.

Ever since World War II, the United

*Graciela Chichilnisky, Ph.D., holds the UNESCO Chair in Mathematics and Economics at Columbia University and is Director of its Program on Information and Resources.*

States has determined the framework for economic activity throughout the world. Through international economic institutions and through the very ways in which economic progress is perceived and measured, this country has tried to shape the rest of the globe in its own image. However, the United States' vision of economic progress requires both a very resource-intensive pattern of growth—corresponding to a rapidly



Pierre Fortin

expanding frontier economy—and the domination of nature through technological change.

Consider, for instance, the theory of optimal economic growth, one of two major economic theories that spread rapidly after World War II. This theory, mostly developed in the United States, envisions an economy that is ever-expanding and resources that are unlimited: it calls for continuous, exponential population growth coupled with continuous, exponential growth in the use of resources. Or take the concept of the gross national product (GNP). A nation's GNP is the sum of the net value of its total production of goods and ser-

vices, computed at their market prices. Anything not sold in a market does not even show up in the GNP; in GNP terms, the value of the whole biomass of the planet, its water bodies, and its atmosphere is zero. Yet today the GNP is universally used as a measure for evaluating economic progress.

Ideas like these have been promoted worldwide by the powerful international economic institutions that were created after World War II: the International Monetary Fund, the World Bank, the General Agreement on Trade and Tariffs. By now the U.S. economic model has taken hold so completely that, all around the world, the extraction and export of natural resources are counted in economic assessments as positive steps. There is no accounting for the exhaustion of the resource base itself—an omission that undervalues the interests of future generations. Depleting petroleum reserves for export, or destroying a forest to export wood or pulp, registers as economic gain because it increases GNP. In a world concerned about the preservation of ecosystems, national accounts value the depletion of resources and the destruction of biodiversity as progress.

The costs of this system have been particularly ruinous in Latin America and Africa, the two areas that have fallen behind economically in the past two decades while pursuing resource-intensive patterns of production and exports. Their problems have been exacerbated by the other major economic theory that took hold after World War II: the theory of international trade based on comparative advantage. This theory holds that developing countries should emphasize exports that draw on their most abundant resources, and it has often been interpreted as a recom-

mendation that they export raw materials and other resource- and labor-intensive products. Thanks to this reasoning, large-scale resource extraction is now seen as a precondition for growth in developing countries.

To see that resource-intensive growth does not work, one has only to compare Latin America and Africa with successful Asian economies such as those of Japan, Taiwan, Hong Kong, and Singapore, which have emphasized technological exports such as consumer electronics and other goods based on skilled labor. Some of these countries have certainly overexploited their resources, but they do not found their economies on resource-intensive products.

The fact is, the resource-intensive export patterns of developing countries do not actually follow the law of comparative advantage. Nor is the world better off, in economic terms, when developing countries specialize in exports that damage the environment. The entire debacle has been a tragic misunderstanding of the nature of growth and trade. To understand what is really going on here, we must look at differences in property rights among countries that trade with one another.

Many traditional societies have long and successful records of managing their common property resources, such as fisheries and forests, through communal forms of governance backed by established tradition. An example is the Tribunal de las Aguas of Valencia, Spain, a thousand-year-old local court that still meets every week to administer the region's water network. Another example is Bahia, in Brazil, which manages its sea resources through a communal system.

Such traditional systems require a small and stable population, so penalties for the overuse or abuse of the resource can be administered effectively—across generations, if necessary. When a region undergoes industrialization, these systems tend

to break down. Outsiders move in, and if they abuse the resource they can easily avoid the penalties by moving out again. The local population itself expands, becoming more mobile and less susceptible to traditional punishments. Eventually, well-managed common property is transformed into an unmanaged "open-access" resource that can be had for the taking. A system of common stewardship crumbles into first-come-first-served anarchy.

When an open-access system prevails on the national level—as is the case in many developing countries today for national assets such as oil reserves, forests, or biodiversity—the only costs computed for the loss of resources are those of exploration and extraction. If the same resources were privately owned, their depletion would be recognized as the depreciation of a capital asset; it would be unthinkable to ignore that cost when calculating the owner's net worth. But an open-access regime is blind to the cost of depleting a resource. And because the costs of extraction are undervalued, the net benefits from extraction are overvalued. The resource is overused, dwindles, and often disappears.

In market economies with large and mobile populations, private-property systems often conserve local resources more effectively than do traditional common-property systems. In some cases, government management will also work to conserve a publicly owned resource. However poorly the United States manages its oil, for example, it extracts little compared with the levels of extraction in developing countries, whose property rights for oil are less well-defined. This country imports most of its oil from Mexico, Venezuela, and Ecuador.

When countries with differing property regimes enter the market to trade with one another, the results can be environmentally disastrous. Whatever the prevailing market price for a resource, more will be of-

fered for sale by an open-access regime than by a private-property regime or a traditional system of communal management. A developing country with a loose management system will therefore appear to have a comparative advantage, even when none exists. This tragic difference between the real and the apparent corresponds to the difference between the private cost of extracting the resource and the larger, uncounted social costs of its loss. In economic terms, it is an accounting mistake; in the real world, it causes profound losses for human beings who depend upon their environments for their livelihoods.

Arguably, international trade as a whole is driven by differences in property rights: resources are overconsumed by nations with well-defined management systems and overproduced by those with ill-defined management systems. The United States, for instance, consumes the underpriced oil of developing countries voraciously, burning through about 25 percent of the world's oil production every year. Anomalies emerge: Honduras exports mahogany to the United States, although it has no comparative advantage in wood products; Mexico exports petroleum to the United States, although its oil reserves are relatively small. And the world economy consumes an inefficiently large quantity of resources, because it takes no account of the true costs of its consumption.

At this critical juncture, there is a ray of hope. Some regions of the world are now undergoing a social and economic revolution whose impact will match those of the agricultural and industrial revolutions. This is a "knowledge revolution," driven by knowledge and the technologies for processing and communicating it. Knowledge is now replacing land and machines as the primary factor of production. The golden age of industrial society, with its voracious and unequal use of the earth's resources, is reaching its logical limits.

A new pattern of economic growth—knowledge-intensive growth—could replace the resource-intensive patterns that have prevailed since World War II.

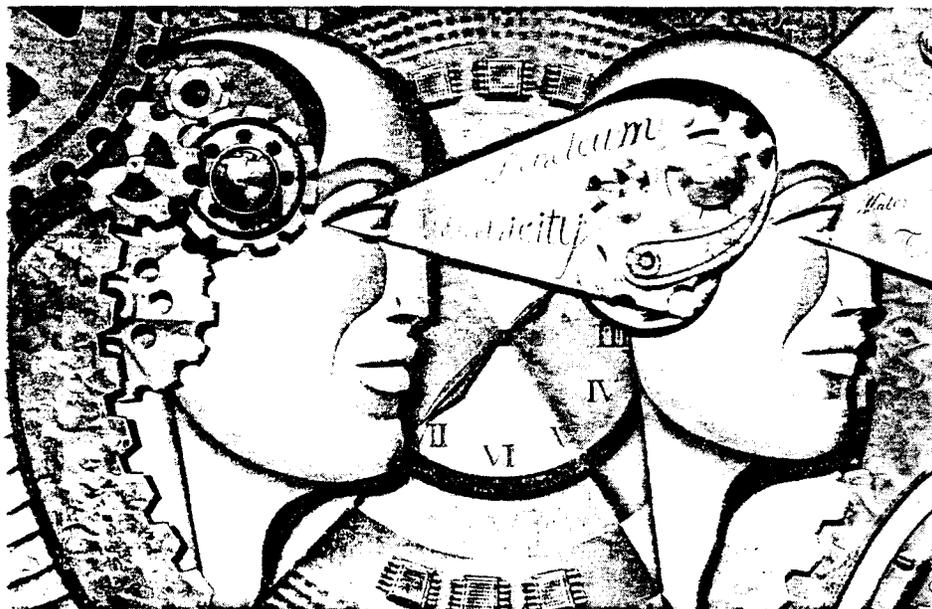
The most dynamic sectors of the new society are those that most benefit from the use of knowledge and information technology as an inexpensive and abundant fuel—exactly as the most dynamic sectors of industrial society were those that benefited from the use of abundant,

proportions are different: the majority of goods produced involve industrial components. Similarly, in the knowledge society we will still produce food and machines, but an increasing fraction of economic output will be knowledge-intensive.

The advent of this new society could not be more timely. The sunset sectors of the industrial economy and the agricultural economy are resource-intensive, making heavy use of minerals, energy, and synthetic

intensive growth resolve today's environmental excesses? It is a tight race against time. The task is enormous. But already, for instance, India has made its mark as a software producer, exporting \$1 billion a year in software products. To achieve the knowledge revolution in full, developing nations must shift rapidly to high-tech industries. More important, they must provide education in order to produce the human capital needed for economic progress.

*Knowledge is now replacing land and machines as the primary factor of production. The golden age of industrial society, with its voracious and unequal use of resources, is reaching its logical limits.*



cheap fossil fuels, and those of agricultural society benefited from abundant, cheap land products. Some of these sectors are the computers and software businesses, telecommunications, biotechnology, entertainment, financial markets, the design and animation fields, and services such as medical treatment and education. As the knowledge society progresses, these "knowledge sectors" will expand more quickly than the rest. The result will be a society that produces mostly knowledge-intensive goods.

None of this means, of course, that we will cease to produce food or machines. Industrial society never ceased to produce agricultural products—on the contrary, it has used more land and produced more food than agricultural society did. But the

chemicals on the one hand, and land, water, and again synthetic chemicals on the other. By contrast, some of the most important sunrise sectors of the knowledge society are relatively environmentally friendly. Human knowledge simply does not need large-scale deployment of materials. (When Microsoft first passed General Motors in market capitalization, GM's chief financial officer exclaimed, "Microsoft—their assets could fit in our parking lot!") Moreover, if the developing world can progress directly to a knowledge-based economy, it could leapfrog the stage of heavy industrialization with which the developed world has so burdened the environment.

Can the world accomplish such a leap? Will the shift to knowledge-

What all of this means is that the most fundamental principles of economics are pointing toward a new vision of society. In such a society, humans would count more than coal, oil, or anything else, because they would produce, contain, and distribute the ultimate source of economic value. Such a society would be innovative in its use of knowledge and conservative in its use of the earth's resources. It would value diversity and human capital. It would offer the prospect of substantial economic progress without damaging the ecosystems that support life on earth.

To create such a society—a fully developed knowledge-based economy—will be far from easy. But it is well worth the effort. •

Illustration by Pierre Fortin