

## DIRE 1972 WARNING OF WORLD IN DECLINE MISSED MARK

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Illustration: Photo

Our blood ran cold as we sat in the dark that year, millions of moviegoers chilled by the vision of *A Clockwork Orange* - a future of anarchy and violence.

That was Hollywood.

The Smithsonian Institution, on the other hand, was the real world, staid and gray. But on a winter's day in 1972, the future quietly laid out there by an international team of researchers was just as frightening.

Mankind was headed for a breakdown - an "uncontrollable decline" in population and production - unless it stopped breeding and consuming at such exponential rates, warned the team's book, *The Limits to Growth*.

The team, from the Massachusetts Institute of Technology, was sponsored by an influential brotherhood of industrialists and scientists called the Club of Rome.

*The Limits to Growth* stirred anxiety and outrage - and sold 9 million copies in 29 languages, spreading the message that urgent action "is a challenge for our generation. It cannot be passed on to the next."

The future - that next generation - is today. It's time to take stock.

### **Apocalyptic vision**

From the heights of the century's end, 1972 looks like a distant planet: a world of 2 billion fewer people, a million more square miles of forested land, a half-trillion more barrels of oil in the ground, a global economy half today's size.

The changes are everywhere.

Where today 165,000 Malaysians labor in a single, giant industrial city, a generation ago farmers tilled their rice paddies. In Arabia, on what were sandy wastes, petrochemical

plants and marble palaces now rise. In India, the hungry rioted over grain shortages 25 years ago; today, the country is self-sufficient in food.

The United States, too, was a different world - a younger nation that laid interstate highway (1,400 miles in 1972), was introducing compact video cameras for everyman and was selling amazing electronic calculators for as little as \$60.

The Club of Rome had asked the four MIT scientists and management scholars to undertake a pivotal study in its project on "The Predicament of Mankind."

The researchers went to work with a complex computer "world model," focusing on trends in population, industrialization, hunger, resources, and the environment.

Diagrammed on paper, the computer's world system was a rat's nest of crisscrossing lines simulating 100 "feedback loops" - cause-and-effect links. Increasing industrial capital, for example, boosted agricultural capital, which influenced the amount of food grown, which affected mortality.

In other words: Just about everything influenced everything else.

Armed with mountains of data and specialists' advice, the team plugged in the latest human fertility rates, resource use rates and other trends, and let their early '70s computers peer into the future:

In the generation or two to come, population, food production and industrial output exploded, depleting metals, energy and other resources so quickly and boosting prices so sharply that by early in the 21st century industrial indexes sank toward pre-industrial levels, per-capita food production crashed and death rates skyrocketed.

The researchers adjusted, hypothesizing better population control, for example, and unlimited resources. But a crash still followed - if later in the century - because of ruinous pollution, eroded land or other factors.

The only solution they could see: "deliberate checks" on economic and population growth.

"Utter nonsense," fumed one anonymous economist in a New York Times article. Critics scoffed at trying to mimic the world with a computer and boggled at the notion of a no-growth economy.

The researchers acknowledged that their model was imperfect but said the world's problems were so blatant that the conclusions were unavoidable.

*The Limits to Growth* had legions of defenders. Columnists and academics seized on its themes - some of which were far from radical.

In his Nobel Prize lecture two years earlier, American agronomist Norman E. Borlaug declared that science might be able to feed the world, "but the frightening power of human reproduction must be curbed."

And that, he now notes with satisfaction, is exactly what happened.

### **Food and population**

Borlaug was one of a dozen scientists, economists and others asked by the Associated Press to look back 25 years after *The Limits to Growth*.

"The dreadful picture of the Club of Rome wasn't followed," the 83-year-old father of the Green Revolution said.

That's an oversimplification in some areas. But in human reproduction, the news contrasts starkly with 1972's dark vision.

Limits, relying on the best projections available, foresaw the world population almost doubling from 3.8 billion in 1972 to 7 billion in 2000. Instead, it will barely reach 6 billion. Its growth rate has fallen from 2 percent a year to 1.4 percent. "Around the world, people chose to have fewer children," said Joel E. Cohen, a leading American demographer.

The key reason cited by Cohen: More women worldwide are educated and working, engaged in a life beyond childbearing.

If the slowdown in the world population's growth is noteworthy, the improvement in its health has been remarkable.

When *The Limits to Growth* was published, worldwide average life expectancy at birth stood at 53 years. By 1995, it had reached 67.

Much of the credit for greater survival goes to fuller stomachs - and credit for that goes to Borlaug and the other green revolutionaries who brought improved seed and advanced farming to the Third World.

Global food production almost doubled during the past generation, while cultivated land expanded barely 5 percent.

On the downside: By the estimates of the U.N. Food and Agriculture Organization in Rome, more than 800 million people remain malnourished, people too poor to buy the abundant food that higher yields produce.

### **Surprising economy**

While human numbers grew just more than 50 percent over 25 years, human economic output doubled.

And the global economy didn't just balloon; it took on surprising new forms, "delinking" in part from energy and materials - producing much more value, especially in services, without digging up or pumping out quite so many resources, in relative terms.

In this, the real world confounded the model world.

The Limits of Growth projections foresaw rapid depletion of minerals. U.S. government data of 1972 indicated that only 21 years' worth of copper was left globally, 15 years of tin, 13 of silver, and that petroleum could run out by 1992.

The Club of Rome team knew more reserves would be discovered, but the computer told them it didn't matter - galloping growth would chew so many raw materials so quickly and prices rise so sharply that crisis inevitably would strike.

Instead, mineral prices have declined in real terms, and the lifespan of reserves still stretches decades ahead for key metals.

"When there's an economic incentive, technology comes through," said economist Marilyn Biviano of the U.S. Geological Survey.

In the past generation, miners have penetrated the polar north and under the sea, and made wider use of leaching, the technology of percolating metals out of ores with liquids.

And recycling underpins much of today's heavy industry: A third of the aluminum used in manufacturing, for example, is drawn not from the earth but from old products. And metals have given way in the age-old process of substitution - plastic taking tin's place in containers, fiber optics displacing copper in communications wiring.

In the biggest industry of all - energy - substitution and efficiencies were spurred by oil price shocks in the 1970s.

Fadhil Chalabi, former chief of the OPEC oil cartel, points out a remarkable fact: The established industrial nations burn less oil today than they did in the late 1970s.

"They used to ask me whether there would be enough oil supplies to meet demand," the Iraqi-born economist said from London. "But my question is whether there will be enough demand to use the supply of oil on Earth."

After relentless exploration in the Saudi desert, the Arctic and the North Sea, global petroleum reserves are now reckoned at 1 trillion barrels, more than twice the "dwindling" reserves of the early 1970s.

Many electric grids, meanwhile, switched to gas or nuclear power, and people are driving more fuel-saving cars and working in more heat-efficient buildings.

## **New pollution menace**

In many ways, air and water pollution has declined in the industrialized northern world since the 1970s. Not in the developing south, though.

In China alone, 3 million deaths since 1994 have been blamed on unhealthy air. And cleaning up downstream and downwind did little to protect against new planetary menaces barely contemplated in *The Limits to Growth*.

By the late 1970s, scientists determined that man's chemicals were thinning the atmosphere's ozone layer, threatening damage to life on Earth. A 1987 global treaty may help repair it, but on another threat - global warming-treaty negotiations are near deadlock.

Most scientists have concluded that carbon dioxide emissions are warming the atmosphere. Such climate change could be an economic catastrophe.

Some resource problems, too, are taking on a global look.

Mankind today uses 200 cubic miles more water annually than it did 25 years ago - the equivalent of a week's flow over Niagara Falls. Shortages are growing acute. Farmland irrigation is running up against limits.

Since the huge gains of the Green Revolution, global farm productivity has leveled off: Per-capita production of grain has declined 1 percent a year since the mid-1980s. At the same time, the ocean fish catch seems to have hit a ceiling.

Food prices are likely to hold or go higher, staying beyond the reach of hundreds of millions left behind as an economic gap widens.

While income in developing nations doubled in the past 25 years as East Asian economies industrialized, the wealth of wealthier countries grew much faster. Today, the richest 20 percent of the world's population collects 85 percent of world income, up from 70 percent a generation ago.

Those who monitor global trends don't see a world system in collapse, as feared by the Club of Rome, but a world splintering between a creative, capital-rich north and vast swaths of a south where the land is eroded and unproductive, the population hungry and still growing, the politics chaotic, the wars endless, and the migrations monumental.

"The real limits to humankind are sociopolitical," said Gilberto Gallopin, an Argentinian mathematician-ecologist who has helped refine "world modeling" since the 1970s, tracking man and his environment through ever more sophisticated computer programs.

The growing rich-poor gap, between nations and within nations, may combine with environmental degradation to inflame "hostility and turbulence and disorder," Gallopin said.

"That's the 'barbarization' scenario, which some of us believe is likely to come in the next 20 to 30 years."

"It may be the first time in history that the poverty in poor countries is threatening the well-being of people in rich countries," Gallopin said.

### **Widening human chasm**

Limits co-author Donella Meadows lives on an organic farm in New Hampshire. She is a biophysicist who writes, teaches at Dartmouth and observes.

The biggest surprise of 25 years, she says, has been the world's greater energy and materials efficiency. And slower population growth has been "gratifying" if "still high."

But she finds foreshadowing of today's problems in their MIT computer printouts: the possible stagnation in farm productivity, the peril posed by long-lived pollutants, particularly carbon dioxide.

And her gaze, too, is increasingly drawn to the widening human chasm.

"It's an illusion to think we can have obscene wealth on the one hand and desperate poverty on the other, and have that be a world anybody - even the extremely wealthy - wants to live in," Meadows said.

The "limits" mankind confronts, a generation later, are the limits that divide it - between those who see the next millennium as a golden age and those who don't see how they'll make it to next year.