FRIENDS JOURNAL

"Plan B"

The Rescue of a Planet and a Civilization

by Lester Brown

If it becomes clear that rising temperatures are shrinking harvests and driving up food prices, we will suddenly have a powerful new lobby for stabilizing climate—namely, consumers.

Those of us who've been working on environmental issues for many years have been saying for some time that if the environmental trends of recent decades continue, eventually we'll be in trouble. What was not clear is what form the trouble would take, and when it would come. I now think it's going to come on the food front, in the form of rising world food prices, and within the next few years.

In each of the last four years, world grain production has fallen short of consumption. We have covered these four years of shortfall—and the last two shortfalls were the largest on record—by drawing down world grain stocks, which are now at the lowest level in 30 years. Now this year it's clear we're facing a fifth consecutive grain shortfall. The only thing we don't know at this point is the size. But the fact that we are facing another shortfall means that at the end of this year world grain stocks will drop to the lowest level on record. The last time grain stocks were this low, 1972-74, world wheat and rice prices doubled. Apart from soil erosion and desertification—about which I could say much, were there more time—there are two relatively new environmental reasons for the shortfall and the resulting decline in stocks and food security: falling water tables, and rising temperatures.

Falling Water Tables

As the world demand for food has tripled over the last half century, the demand for irrigation water has also tripled. In many parts of the world that has led to the overpumping of aquifers. Half of the world's people now live in countries where water tables are falling and wells are running dry. These countries include China, India, and the United States, the three big grain producers that together account for nearly half of the world grain harvest. In the United States, water tables are falling throughout the southern Great Plains and the southwest.


Reuschle/World Council of Churches

A magazine that comes out of California called *The Water Investigator* has a section in it each month on water sales. Almost every day there's another water sale in the western U.S.—a farmer or an irrigation district selling their water rights to cities because they can pay so much more for the water than the farmers can earn from using it for irrigation. So we're seeing farmers now with a double squeeze: a shrinking water supply, as aquifers are depleted and wells go dry, and a shrinking share of that shrinking supply, because cities around the world are taking more and more water.

In India, water tables are falling in most states, including in the Punjab, the breadbasket of that country. In China, water tables are falling throughout the northern half of the country, including under the North China Plain, that country's breadbasket. Overpumping for irrigation is a way of expanding food production today that almost guarantees a decline in food production tomorrow when the aquifers are depleted and the wells go dry. We're quite literally borrowing water from the future.

Most of us do not realize how water intensive food production is. We drink, each day, in one form or another—as water, juice, milk, pop, beer, coffee—nearly four liters of water a day. And the food that we eat each day requires 2,000 liters of water to produce, or 500 times as much. It takes a lot of water to produce food. Most of us have not yet connected the dots to see that water shortages equal food shortages. Seventy percent of all the water we use is for irrigation; industry uses 20 percent and cities 10 percent. So, falling water tables mean shrinking harvests.

Rising Temperatures

The second trend affecting food production is rising temperatures. New research by crop ecologists at the International Rice Research Institute in the Philippines and the U.S. Department of Agriculture indicates that for each one degree Celsius (1.8° f) rise in temperature during the growing season, we can expect a 10 percent decline in yields of wheat, rice, and corn. In 2002, intense heat and drought reduced the grain harvest in India and the United States. Last year, Europe bore the brunt of intense heat. London, for the first time in history, recorded triple-digit temperatures. Every country from France east through the Ukraine saw its grain harvest decline as a result of intense heat during the last half of the summer. Thirty-five thousand people died in eight countries from record temperatures. That's ten times the number who died on September 11, 2001.

The rise in temperature appears to be accelerating; the four warmest years on record have come in the last six years. Temperature does not go up every year; in some it actually declines somewhat. But CO_2 levels, which we can measure with great precision, rise every

year—the most predictable environmental trend there is.

The International Panel on Climate Change, a group of some 1,500 scientists that the UN has organized to study the Earth's climate and project changes, are projecting that average temperatures will rise somewhere between 1.4 and 5.8 degrees Celsius—the latter is over 10 degrees Fahrenheit—during this century. Some people recently born may live to see a planet that on average is 10 degrees warmer than it is today. It's going to make it much more difficult for farmers to keep up with the demand to feed the 74,000,000 people being added to the world population each year, with water tables falling and temperatures rising.

The Wake-Up Call: Food

I think the wake-up call is going to come in the form of rising food prices. The event that I expect will trigger this dramatic rise in food prices will be when China comes into the world market for massive quantities of grain. Between 1950 and 1998, China increased its grain production from 90,000,000 tons to 392,000,000 tons, more than fourfold. It's one of the great economic success stories of the last half century. But since 1998, its grain production has dropped to 322,000,000 tons, a drop of 70,000,000 tons in five years. The causes of this are spreading water shortages, the conversion of cropland to nonfarm use, and the new Chinese love affair with the automobile. The two million new cars sold in China last year require paving the equivalent of 100,000 football fields in highways, roads, and parking lots.


Larry Miller

The drop in China's grain production over the last five years—70,000,000 tons—exceeds the entire grain harvest of Canada. Thus far, China has been covering this decline in its grain production largely by drawing down its once massive stocks of grain, but they are now largely depleted. For wheat, it has already turned to the world market. Wheat buying delegations from China to Australia, the United States, and Canada have bought 9,000,000 tons of wheat since the beginning of November, automatically making China the world's largest wheat importer. When China comes into the world market for 30-50 million tons of grain—more than any other country imports by far—it will necessarily come to the United States, because we control close to half of the world's grain exports. We're looking at a fascinating geopolitical situation where 1.3 billion Chinese consumers, with a trade surplus with the U.S. of $120 billion (enough to buy the entire U.S. grain harvest twice) will be competing with us for our grain, driving up our food prices.

So, it's not a question of whether the Chinese will be able to compete with us for our grain and drive up our food prices—they will. Now, 30 years ago, if any country had done that, we would have lowered the boom and would have restricted exports, or even embargoed them. But today we have a stake in a politically stable China—it is not only the

economic engine powering the Asian economy, it's the only large economy in the world that has had a full head of steam in recent years. The entire world has been leaning on China to keep the world economy growing. Within a few years, I fully expect we will be loading one, two, three ships a day of grain heading across the Pacific to China. That long line of ships is going to tie the two economies together with an intimacy that we've never experienced before—with China, or indeed with any other country. Managing the flow of grain between the U.S. and China, and trying to satisfy the interests of consumers in both countries, will be one of the big foreign policy challenges of the years ahead.

We're moving into an era that's different from anything we've known. For the first time in history the Chinese will be heavily dependent on the outside world for part of their food supply. For the United States, it will mean that, like it or not, we're going to be sharing our food with 1.3 billion Chinese consumers. It will be a new world. Now, remember we started with environmental trends like falling water tables and rising temperatures. These trends, then, have an economic effect—rising food prices. A doubling of grain prices, which is a distinct possibility, would destabilize governments in a multitude of low-income countries that import a substantial amount of grain. This political instability could disrupt global economic progress and begin to affect the Nikkei stock index, the Dow-Jones 500, and so forth. At that point, we might realize that we can no longer continue to neglect the environmental trends that are undermining our future. That, I think, may be the wake-up call—there is no economic indicator that is more politically sensitive than food prices.

Now, at that point we're going to have to make some decisions, and I'm convinced that Plan A—business as usual—is simply not going to work much longer. So, we look elsewhere. The three principal components of a "Plan B" that I outline in my book with that title, are: first, a global "full-court press" to raise water productivity; second, putting the brakes on population growth sooner rather than later; and third, reducing carbon emissions to stabilize the climate—not by 5 or 10 percent, but by 50 percent over the next decade.

Raising Water Productivity

In regard to raising water productivity, I'll just cite a few examples.

We have a number of irrigation techniques with varying degrees of efficiency, and we need to take a look at these—flood irrigation versus drip irrigation, for example. Flood irrigation takes a lot of water. Drip irrigation takes much less. In cities, we've inherited, in engineering terms, a system where water comes in one side of the city and leaves on the other side. We call it the "flush and forget" system. The water is only used once, and it's gone. However, Singapore, for example, which has to buy its water from Malaysia, is beginning to recycle its urban water supply. We have the technologies now to do that. Often, the idea of recycling sewage water elicits a "Yecch"; no one seems to like the idea. But in reality, all the water we use even has been through the dinosaurs: through system after system after system. The only trick is to get it clean. Cities don't need to consume a lot of water; they can just keep using it over and over. This is an example of the kind of thinking we need to do.

Slowing Population Growth

On the population front, there are two things we need to do. First, we need to fill the family planning gap. The UN Population Fund estimates that 120,000,000 women in the world want to limit the size of their families but do not have family planning means. There are

many more who, with a little education, would see the advantages of doing so. We need to make sure that every woman in the world has access to family planning services and reproductive healthcare.

The second thing we need to do is create the social conditions that will facilitate a shift to smaller families. That means investing in education for both girls and boys. And it means advancing the UN millennial goal of universal primary school education worldwide by 2015. We also need to organize school lunch programs for the poorest countries: first, it helps to get the kids into school, and second, it's very difficult to learn if you haven't eaten all day. The costs of family planning services, reproductive healthcare, universal primary school education, school lunch programs, and basic village level healthcare in the poorest countries would come to an additional $62 billion a year. Now, $62 billion is a lot, but it's less than $87 billion a year, the cost of the U.S. war in Iraq. Jeffrey Sachs, an economist formerly at Harvard and now at Columbia, has pointed out that for the first time in history, the world has the resources to eradicate poverty everywhere if we want to do so. I think the time has come.

Stabilizing the Climate

The third component of "Plan B" is stabilizing climate. If it becomes clear that rising temperatures are shrinking harvests and driving up food prices, we will suddenly have a powerful new lobby for doing so—namely, consumers. The way to stabilize climate is by cutting carbon emissions through reduced demand for energy. Let me use a couple of examples to illustrate how we can do so rapidly. First, we could phase out all old-fashioned, inefficient, incandescent light bulbs and replace them with compact fluorescent bulbs that use only a third as much electricity. If you replace all the incandescent light bulbs with compact fluorescents, the investment you make will earn you about 30 percent per year. And second—the Toyota Prius is a remarkable piece of automotive engineering with its gasoline-electric hybrid engine and something like 55 miles per gallon on average. If, over the next decade, we were to raise the fuel efficiency of the U.S. automobile fleet to that of the Toyota Prius today, we would cut gasoline use in half. No change in the number of cars or the number of miles driven, just doing it with much more efficient technology. And it's not technology we have to invent—it's on the road now. We just need to expand production.

Wind Power

I've covered some of what we can do to reduce energy use on the demand side, in fossil fuel use. On the supply side, we have a number of renewable sources with a lot of potential: wind, solar, geothermal, biomass. Worldwide wind-electric generation has been expanding by 30 percent a year since 1995, an increase of fivefold or so. The modern wind industry was born in California in the early 1980s, but in recent years Europe has taken the lead. Today, the residential

Wes Cheney

electricity needs of 40,000,000 Europeans are being satisfied by wind-generated electricity. The European Wind Energy Association projects that by 2020, half of Europe could be getting its residential electricity from wind power. If European governments get serious about developing their offshore wind capacity, by 2020 Europe could be getting all of its residential electricity needs from wind.

In the United States, there are now commercial wind farms in 22 states that are feeding electricity into the grid. In 1991, the U.S. Department of Energy pointed out that three of our 50 states, North Dakota, Kansas, and Texas, had enough harnessable wind energy to satisfy national electricity needs. And that was based on the limited technologies of 1991. Advances in wind turbine design since then enable turbines to convert wind into electricity more efficiently, and they harvest a much larger amount—whereas the average wind turbine in 1991 was around 120 feet tall, the ones going in today are 300 feet tall. Not only is it on a larger scale, but the wind is much stronger up there than it is closer to the land surface. Wind is a huge resource.

My son called me some time back; he had been driving on an interstate in West Texas and had seen there one of the new wind farms. Texas is developing wind energy very rapidly and is pressing California for leadership among the states. He said he saw this new wind farm and saw rows of wind turbines receding toward the horizon. And interspersed among them were oil wells. He said the wind turbines were turning, and the oil wells were pumping, and he said he saw the past meeting the future. What he was seeing was the energy transition.

Yesterday on television, I saw my old friend Ken Lay of Enron in handcuffs for the first time. I don't know all the problems that led to Enron's demise, but Ken Lay had a vision. As is well known, Enron has natural gas fields in Texas and a network of oil pipelines going to the Northeast, the Midwest, and one that goes all the way to California. Another idea of his was, one day, to have enough wind farms in Texas to electrolyze water and produce hydrogen and use that natural gas infrastructure, when the gas was gone, to distribute hydrogen. Maybe Ken was too much of a visionary, I'm not sure. But anyhow, this was an idea he had and I think it was a sound one. He had bought two wind companies, one in California and one in Europe, and Enron Wind was one of the profitable parts of Enron. It was bought by GE for $385 million, and what was Enron Wind is now GE Wind.

Wind has an enormous potential. There are six reasons why it's doing so well: it's abundant, cheap, inexhaustible, widely distributed, clean, and climate benign. No other energy source has all those attributes. So I think we're going to see wind becoming the centerpiece of the new energy economy. And the cost? In the early '80s in California, wind-generated electricity cost 38 cents a kilowatt hour. In the last few years it's been down to 4 cents a kilowatt hour in some places in this country; there have been a few long-term supply contracts signed at 3 cents a kilowatt hour; and by 2010, projections are that in many parts of the world it'll be down to 2 cents a kilowatt hour. Wind energy is cheap, it will be cheap, and it's inexhaustible. Once you make the investment, it will last forever.

Hybrid Engines

Now, I'm coming back to the Toyota Prius. If we strengthen our electric grid and actually construct a national grid,

tying the regional grids together, with a capacity to move electricity not only within regions but among them, then we can invest heavily in wind farms all over the country that feed into the grid. If you take a car designed like a Toyota Prius with a hybrid engine, add a second battery, and plug it in sometime between one and six a.m. when electricity demand drops but the wind continues to blow, you could recharge. Having a second battery would give more than enough storage capacity to commute to work, up to 15 miles roundtrip. You wouldn't need to use any gasoline at all while you're commuting. You'd still have the gasoline capacity and the gas-electric hybrid, so if you want to go for a long drive on the weekend, 200 or 300 miles or whatever, you could do it, no problem. In fact, it only takes half a tank with a hybrid engine because it's so efficient. The point I want to make is that we now have the technologies needed to largely power our fleet of automobiles with wind energy.

In recent years I have emphasized the evolution of the hydrogen economy. Fuel cells are quite efficient, but the advantage of the system I just mentioned is that the electricity is used directly to power the automobile. If you use the hydrogen fuel cell, the wind generates electricity, which electrolyzes water, which produces hydrogen, which runs a fuel cell, which generates electricity. At each stage there's a loss in efficiency. So now there's a growing shift in thinking among the people in the energy field that maybe what we should do is simply move towards using gas-electric hybrids with a plug-in capacity.

How Fast Can We Change?

One of the things that we have to ask ourselves if we face a rapid need to restructure the world energy economy is: How quickly can we do it? The example I just gave is one of the ways we can move very quickly. Here's another approach: while I was researching "Plan B", I went back and reread some economic history of World War II. In particular, I read President Roosevelt's State of the Union Address, on January 6, 1942, one month after Pearl Harbor. In this address he laid out arms production goals. He said we're going to produce 45,000 tanks, 60,000 planes, 20,000 artillery guns, and 6,000,000 tons of shipping. No one had ever heard of numbers like this before. But what he and his colleagues in the administration realized was that at that time, the largest concentration of industrial power in the world was in the U.S. automobile industry—even during the Depression we were producing 3-4 million cars a year. So, after he gave his address, he called in the leaders of that industry. And he said, because you represent such a large share of our industrial capacity, we're going to depend heavily on you to help us reach these arms production goals. And they said, well Mr. President, we're going to do everything we can, but it's going to be a stretch, producing cars and all these arms, too. And he said, you don't understand, we're going to ban the sale of private automobiles in the United States. That's leadership. And what we actually did was to exceed every one of those production goals. From April 1942 until the end of 1944, there were essentially no cars produced in the United States. The whole automobile industry was restructured. Not in decades, or in years, but in months. I use this example because if it becomes urgent for us to do something, and if we have leadership, there's no limit to what we can do, and how quickly we can restructure the energy economy. I could go through a long list of things we can do, but the point is, we can turn things around quickly if we need to.

The key to making a shift like that is getting the market to tell the ecological truth. We are all economic decision makers—as consumers, corporate planners, government policy makers, and investment bankers—and we rely on market signals to guide our

decisions and our behavior. But the market is now giving us a lot of misinformation. It's not telling us the truth about prices and about costs. For example, when we buy a gallon of gasoline, we pay the cost of pumping the gasoline out of the ground, refining the gasoline, and delivering the gasoline to the local service station—but we do not count the cost of damage for acid rain, respiratory illnesses from breathing polluted air, and certainly we do not count the devastating cost of climate change.

We have a model now for how to do this. The Center for Disease Control in Atlanta published a study on the cost to society of smoking cigarettes. Not counting the premature deaths caused by smoking, but just looking at the costs of treating smoking-related illnesses and lost worker productivity, they concluded that the cost to society of smoking a pack of cigarettes is $7.18. Someone bears those costs now, by the way—it may be the worker, the employer, or taxpayers paying the Medicare cost of treating smoking-related illness.

With gasoline, we don't know what the true cost is because we haven't done the research. It's more difficult—we have to deal with climate change projections, for example. When we do find out, I think we will discover that the costs are extraordinarily high. For instance, during this century, a rising sea level of one meter is well within the range of possibility. The World Bank has published a map of Bangladesh, showing the effects of such a rise in sea level. Half of Bangladesh's rice land would be inundated with salt water, and 40,000,000 people would be displaced. We may soon decide that the cost of climate change is unacceptably high, and we may simply not want to leave it for our children to deal with.

To recapitulate: we now have the technologies to drastically reduce carbon emissions, and I recommend cutting carbon emissions in half worldwide by 2015. This is entirely doable, if we decide we want to do it. Let's look at public expenditures, particularly at the U.S. defense budget. Before the Iraq war, that budget—about $343 billion for military purposes and let's assume $17 billion for state and aid programs—was $360 billion. If we were to start with a fresh slate and a foreign policy budget of $360 billion a year, how should we allocate it between military purposes and meeting the social goals I talked about earlier of eradicating poverty? Out of what is now a $400 billion budget or more, what if we decided to spend $100 billion for development, instead of the $10-$12 billion it is now? I think our foreign policy interests would be much better served that way, and I think the world would support us in those efforts, if we took the lead.

On September 11, 2001, I was in New York City to give a luncheon address at the *New York Times* on my book that was coming out then, *Eco-Economy: Building an Economy for the Earth*. By midmorning, that lunch was already history. It still hasn't taken place. We tried to reschedule it, but everyone was scrambling to cover the attack; and then, remember the anthrax scare? All the science and environmental writers were working on that. What I've become aware of since then is that governments and the media have become so preoccupied with terrorism that they're losing sight of the environmental trends. If Osama bin Laden and his colleagues succeed in diverting our attention from these trends that are undermining our future, they may reach their goals, in ways that even they have not imagined. ❑

Questions and Answers
Attenders of Lester Brown's address on July 9 were invited to remain for a question-and-answer period immediately following his remarks. This is the edited text on selected topics.

Q: Could you address the issue of genetic engineering and its effects on grain production?

Lester Brown: The ads of the companies in the business of genetically engineering new crop varieties talk about solving the world's food problem, doubling world food output, and so forth. There have been scores of crop varieties, genetically modified, that have been released for commercial use. But they have been primarily varieties that resist insects and tolerate herbicides. But in terms of increasing yields, we have not seen anything so far. What genetic engineers have been best at is developing pest-resistant varieties, and for cotton that has greatly reduced the use of pesticides. Meanwhile, herbicide-resistant soybeans make it possible for farmers to use minimum or even zero tillage, reducing water runoff and soil erosion, but increasing herbicides in the environment for sure.

Q: Do you think desalinization could solve the water problem?

Lester Brown: Saudi Arabia now gets about 70 percent of its fresh water from desalting. Basically, they're turning oil into water. But most countries don't have that wealth to work with. And if you look at it from an economic point of view, the cost of desalting sea water will have to be reduced about tenfold before you could even think about using it for irrigation. Keep in mind, it takes 1,000 tons of water to produce one ton of grain.

Q: Are you championing the larger, centralized energy sources rather than the smaller, more decentralized ones?

Lester Brown: In a sense I am, and in a sense, maybe not. For example, when we shift to wind energy, or to solar energy, we're shifting to a widely dispersed source of energy. This is in contrast to oil that's concentrated in a relatively small number of countries and in one small geographic region of the world. With wind energy one can build wind farms. These are very popular in the Great Plains states, for example. And here the competition for wind farms is fierce. One turbine can earn a farmer or rancher a royalty of $3,000 dollars a year and you don't invest a penny—you just give the right to build it on your land and harvest the wind. I fully expect that within five years or so there will be thousands of ranchers in the Great Plains who will be earning more money from electricity sales than from cattle sales. Another way of approaching this is to build small wind turbines for individual residences, farms, and ranches. And usually, if they generate more electricity than they need they can feed it back into the grid through a reversible meter. Solar cells for electricity go on rooftops of each home. That's about as decentralized as you can get.

Q: Is it true that producing beef requires 100 times as much water as producing a pound of wheat or vegetables?

Lester Brown: The conversion of grain to livestock goes something like this. For beef in the feedlot, it takes about seven pounds of grain for an additional pound of live weight. That is, for every seven pounds of grain concentrate the steer eats, he gains about one pound. For pork, it's less than four pounds of grain per pound of live weight. For poultry, it's maybe

two and a half pounds. For catfish it's less than two pounds. If you have a piece of land in Iowa, you can grow corn on that land, 140 bushels with no trouble, or you can grow soybeans on that land, 35 bushels per acre. So corn yields are four times those of soybeans. If you feed the corn to chickens or catfish, you will end up with more edible protein than if you grow soybeans and consume those soybeans as tofu. If the alternative to animal protein in your diet is soy protein, it takes quite a bit of land to produce soybeans. The reason is, it's a legume, it's very high in protein, it takes a lot more metabolic energy to produce protein than to produce starch. But because poultry and catfish are so efficient at converting, we probably would end up further ahead eating more poultry and farmed fish.

Q: Do you have any concerns about the effect of wind farms on migratory birds?

Lester Brown: Some of the early wind farms that were developed without thought to migratory bird patterns have been problematic. Since then, a large amount of scientific information on migratory bird routes has been collected. I've seen a table of bird deaths in the U.S., and the big causes of bird deaths are cats and cars. Over 20 million each per year from each. You can hardly put wind turbines on the same chart, the number is so small by comparison. But it doesn't mean we should forget it, and, fortunately, the wind farm developers have learned that by now.

Q: Is it true that the Europeans, like the Danes, have achieved a standard of living comparable to the U.S., but they use only half as much energy and resources?

Lester Brown: That's essentially true. The interesting thing is that they have redesigned their transportation systems. Copenhagen is one of those cities, and Amsterdam is another, where 35-37 percent of all urban trips are by bicycle. In Copenhagen, they have wide bicycle trails and lots of bicycles, so it becomes very easy. There are places in Europe, in the Netherlands, I think Amsterdam, where the traffic lights are designed to favor bicycles, so when the light changes, bicycles go first and cars follow. In Utrecht, a college town in the Netherlands, I did bicycle/car counts, and it was something like 19 bicycles for every car. What the Europeans have done is realize that the automobile is not the answer to all of our problems. And so they've begun to develop bicycle-friendly transportation systems.

Q: A couple of years ago, I believe it was one of your former colleagues at World Wide Institute, Christopher Flavin, who published a new idea for drastically reducing carbon emissions, the reverse carbon option. Are you familiar with that? Or was that your idea?

Lester Brown: There are two general ways of reducing carbon emissions. One is to restructure the tax system, that is, reduce income taxes and offset that with an increase in carbon taxes—figure out what it costs to burn a gallon of gasoline, increase the tax on gasoline and lower the income tax. Don't change the tax level, just restructure. There's another way of doing it where the government limits carbon emissions next year, say, to three billion tons in this country, then you sell the permits to industries, and then that cost is passed on to individuals. It would be incorporated into the economic system. There are pros and cons for both.

Q: Can you talk a little bit about the problems involved with deforestation?

Lester Brown: Let me answer that question by describing an experience the Chinese had several years ago. In the summer of 1998, there was extensive flooding in China, in the Yangtze River basin. It went on for weeks and weeks. In the end it did $30 billion worth of damage. The Yangtze River basin is home to 400,000,000 people, and the $30 billion figure exceeded the value of the annual Chinese wheat and rice harvest combined. This was not a trivial loss. For several weeks, the Chinese said, "Well, this is an act of nature." But in mid-August, they abruptly changed their analysis. They had a press conference in Beijing and said that there was a human contribution to the flooding, in the form of deforestation. They said, "We are now banning as of today," that day, "all tree-cutting in the Yangtze River basin." They went on to justify it by saying, the flood control service provided by trees is three times as valuable as the lumber in the trees. The way to deal with the deforestation problem, and one of the things that some European countries have done, is to have a stumpage tax. For each tree you cut, you pay a fee. And they keep raising that fee to the level that will stabilize the forested area in a country.

Q: What is the current status of automobile use by the middle class in China and India?

Lester Brown: The demand for automobiles is growing, no question. There were two million new cars sold in China last year. My guess is that the principal constraint on the growth of automobile fleets in China and India, is going to be the loss of cropland—the amount of cropland that's paved over to support those cars. In 1994 China announced that it was going to develop an automobile-centered transportation system. A group of senior scientists (many of them members of the National Academy of Scientists) produced a white paper that challenged that decision on several grounds. First, they said that China does not have enough land to support an automobile-centered transportation system and feed its people. Second, they pointed out that China would become a huge oil consumer and importer. Third, they said congestion would become unmanageable. And I think they're right on all three points. There just is not enough land to accommodate the automobile. I think we're going to have to come up with an alternative, and what the Chinese scientists proposed was to turn to light rail systems in detailed networks, augmented by bicycles. And that's where I think the world will be going, including the United States.

Lester Brown is an environmental analyst and founder of Earth Policy Institute in Washington, D.C. Two recent books of his are *Eco-Economy: Building an Economy for the Earth* and *Plan B: Rescuing a Planet under Stress and a Civilization in Trouble*. This article is the edited text of a plenary address delivered on July 9, 2004, at the Friends General Conference Gathering held in Amherst, Massachusetts.

This is the feature article from the October 2004 issue of FRIENDS JOURNAL

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