

China Faces Environmental Challenge

A new book and recent Chinese publications cite massive deforestation, expanding deserts and heavy pollution of land, water, and air

In recent years, China has begun to face enormous environmental problems. In agriculture and industry alike, government policies have led to massive pollution of land, air, and water, and the destruction of much of its natural resources. According to one scientist, the situation has deteriorated to the point that the government is undermining its own goals to modernize and expand its gross national product. Vaclav Smil of the University of Manitoba describes many of China's environmental challenges in *The Bad Earth*, a new book based on a study he conducted 2 years ago for the World Bank.* Although Chinese newspapers and magazines distributed to foreigners paint a much rosier picture of the state of the environment, Smil's book, which stems mainly from articles published for the Chinese, and other, more recent Chinese articles confirm that the country's ecological problems are serious in both urban and rural areas. Almost all of China's major cities are heavily polluted because the nation is still largely dependent on coal as an energy source. Beijing is battling severe air pollution because of industrial contamination and dust from soil erosion from the surrounding countryside. Shanghai is contaminated by acid rain. Ninety percent of the country's urban sewage is not treated. Nor is much of the waste from industry before it is dumped into the waterways and used to irrigate crops. China has also stripped itself of forests which has led to soil erosion and flooding.

Smil, who is a professor in the department of geography and has written extensively on China's energy and environmental problems, said in an interview that China's environmental problems are "no different than those of any other developing nations," except that they are exacerbated by the country's extremes in climate and its tremendous population. He contends that it is China's "staggering mistreatment of the environment that may well be the most fundamental check on China's reach toward prosperity."

Smil believes that China's environmental problems are rooted in the country's drive to increase grain production and to industrialize. To boost grain pro-

duction, for example, the government ordered vast tracts of forests and grasslands converted into cropland. But the efforts were largely unsuccessful and merely resulted in massive soil erosion. According to a 1983 issue of the Chinese *Journal of Ecology*, China annually loses 5 billion tons of soil through runoff.

Smil reports so much forest has been destroyed that China now only has about half the amount of forest as the United States, which is comparable in land-mass. China's forests, he says, are rapidly receding—from the boreal stands of firs and pines in the northeast provinces to the mangroves of the southern island of Hainan. The Communist government has recognized the problem of deforestation since it took power in 1949 and has

China's drive to increase grain production and industrialize have led to the problems, Smil says.

repeatedly initiated tree planting campaigns to replenish the timberlands. But Smil says that the survival rates have been "appallingly low, often much below 10 percent" because of careless planting, inadequate follow-up, and the wrong choice of tree species for a certain area. At the same time there is apparently a substantial amount of illegal lumbering.

Soil erosion has also been aggravated by the Chinese government's push to convert natural grasslands into crop-producing areas. In the northern areas of China, 170,000 square kilometers of former grassland has become desert because of failed attempts at reclamation and overgrazing. The efforts were largely unsuccessful because the grain crops were unsuited to the targeted areas.

With the goal to produce more grain and other food, China has also been using increased amounts of fertilizer and pesticides on its crops, which has generated more ecological problems. Because the chemicals have been improperly applied or overused, crops, soil, and water supplies have been contaminated, according to scientists in the Chinese journal *Agricultural Environmental Protec-*

tion. The article said that wheat and other grains tested from the Manchurian province Heilongjiang showed residual amounts of organic chlorides that were 20 times greater than the standards set by the United Nations. Vegetables grown near the provincial capital of Harbin contained 32 parts per million (ppm) of residual benzene hexachloride. The national standard is 0.2 ppm, the article said. Tissue samples from hogs, cattle, and sheep all had pesticide levels that exceeded national standards. The misuse of pesticides is already showing up in humans, the journal said.

While unwise agricultural policies have led to serious pollution, Li Ximing, the minister of Urban and Rural Construction and Environmental Protection, said recently that "environmental pollution in China is principally caused by industry." Much of the industrial pollution results from China's extremely inefficient use of coal, the country's principal source of energy. According to Smil, China is the least efficient nation for converting coal into commercial use. He says in 1979 China required 2.4 kilograms of coal equivalent for each dollar of gross national product. In contrast, the United States required nearly half the amount at 1.25 kilograms and Japan used even less at 0.6 kilogram of coal equivalent. Examples of industrial pollution abound in Chinese publications. Some of China's largest chemical plants and oil refineries are located in the new industrial city of Lanzhou in northwest China. The companies "have contributed greatly to the country's prosperity," says the magazine *China Reconstructs*. But Lanzhou has paid a price for production. During the late 1970's, the air pollution was extraordinary. The Chinese government cracked down on the factories and the pollution was reduced, *China Reconstructs* says. But according to the provincial newspaper *Gansu Ribao*, the residents still complain that the sky is "foggy in the morning and in the evening." Much of the pollution is apparently caused by sulfur dioxide that turns into acid rain.

Water quality in the cities has also become worse, according to an article in the Chinese publication *Geographical Knowledge*. In the Shanghai river delta, 95 percent of the industrial and domestic sewage is directly released into the wa-

*V. Smil, *The Bad Earth* (Sharpe, Armonk, New York, in press).

terway. In Nanjing, a plant producing aniline dumped 9,000 tons of sludge and 20,000 tons contaminated with the poisonous organic chemical into the waterways. *Environmental Protection* also reported that "there was a high frequency of illness among the workers at the plant." In 1978, pollution controls were installed and the situation greatly improved, the report said. Even so, the wastewater contaminated with aniline was only reduced by 60 percent.

To complicate pollution problems, the Chinese government is now encouraging the use of urban sewage in agriculture because of water shortages in the countryside resulting from poor water management and droughts. One city's environmental protection office found trace amounts of cyanide and heavy metals in vegetable crops. The peasants complain that "sweet potatoes from these areas do not soften during cooking, rice . . . has an unusual taste, and eggplants and tomatoes irrigated with sewage . . . are likely to rot," according to a Hebei newspaper.

China has taken some positive steps, some that are symbolic and some that are more substantive, to curb pollution. Minister Li Ximing has given speeches acknowledging the country's environmental problems. He and others in China have stressed conservation as the best immediate solution to control pollution and prevent further ecological damage. He has also said that heavy industry should no longer be allowed to expand in major cities that are popular tourist spots, such as Beijing, Hangzhou, Suzhou, and Guilin, where "industry is already concentrated and environmental quality is poor." According to the government, heavy industry must now include pollution controls in future construction plans. In agriculture, the government has changed its policy so that regions may have more flexibility to choose which crops they may grow. The national campaign to plant more trees continues and the goal for 1985 is to ensure 65 percent survival of the seedlings.

Although the government seems to be saying all the right things in regard to environmental protection, substantial improvements are likely to be long in coming. "We are gradually paying more attention to the environment," says Peng Feifei, second secretary of the Chinese embassy in Washington. "Things are changing a lot." But, according to Smil, the changes will have to be pursued much more aggressively if, in the long run, China wants to meet its economic goals.—MARJORIE SUN

NSB Education Commission Produces Grand Design

The National Science Board (NSB) Commission on Precollege Education in Mathematics, Science and Technology has delivered an ambitious plan of action designed to achieve world leadership in science and math education for the United States by 1995. Federal initiatives in the plan would require appropriation of some \$1.5 billion in the first year. The Reagan Administration has insisted that new federal funding for education be limited to a fraction of that sum (*Science* 11 March, p. 1198).

NSB, the policy-making body of the National Science Foundation (NSF) formed the commission in mid-1982 at a time when the precollege education program of the foundation was facing extinction at the hands of Administration budget makers. The impression at the time was that the commission was expected to pick up the pieces and advise NSF on how to rebuild a viable precollege program in science and math education, but the report has a focus vastly broader.

The report's recommendation, which is likely to be most controversial, calls on the federal government to help finance 1000 "exemplary" elementary schools and the same number of secondary schools across the United States. A federal contribution of \$276 million a year for three years is projected. The report also recommends a retraining program for teachers of math and science who are not fully qualified for the job, at a cost of \$349 million a year for 5 years.

In the policy realm, the report asks that the President appoint a National Education Council, which would report directly to him, to recommend national educational goals and to monitor progress toward them. Establishment of governors' councils to perform a similar function at the state level is also urged.

Among additional recommendations was that more time in the school day be devoted to math, science and technology. The commission suggests that through the sixth grade 60 minutes a day be spent on mathematics and 30 minutes on science. In grades 7 and 8 math, science, and technology should each be taught for

a full year. High school requirements should be raised, so that all students take at least 3 years of math and 3 years of science and technology, including a semester of computer science. Requirements for college admissions should be raised to 4 years each of high school math and science.

The 20-member commission launched a wide-ranging study 17 months ago. Its cochairmen were William T. Coleman, Jr., former Transportation Secretary in the Ford Administration and, Cecily Cannan Selby, former dean of academic affairs and chairman of the board of North Carolina School of Science and Mathematics.—JOHN WALSH

Technology Export Law Reform Facing Difficulties

A move to ease the export of U.S. technology, framed as part of the reauthorization of the Export Administration Act which expires on 30 September, now is expected to face stiffer opposition on Capitol Hill because of the Korean plane incident.

The bill, H.R. 3646, sponsored by Representative Don Bonker (D-Wash.), seeks to simplify and redefine federal policy governing the export of U.S. goods, including technologically sophisticated items and the know-how needed to run them. The bill is intended to limit the President's authority to restrict such exports as President Reagan did when he blocked the export of U.S. technology for the European-Soviet pipeline. The bill would prohibit such actions, except during emergencies, without approval by Congress.

Other provisions of the bill would streamline the export of technology to allies. Currently, certain exports may be subject to review at several levels—a process that is inefficient and "a serious irritant to U.S. allies and an obstacle to consensus" among them, according to a report by the House Committee on Foreign Affairs.

The reform bill also emphasizes the need to sustain "vigorous scientific enterprise by protecting the ability of scientists and scholars to communicate their research findings." It also states that the United States must preserve its reputation as an exporter by controlling hazardous goods and