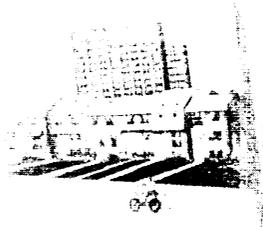

Section II

SUMMARIES OF OTA REPORTS COMPLETED IN 1979

The assessments carried out by OTA cover a wide spectrum of major issues before Congress and the country and examine a broad range of policy options and their potential impacts. To provide examples of the breadth and depth of OTA's work, summaries of reports published by the Office in 1979 are presented in this section.

The reader is cautioned that these are summaries of reports. They do not cover the full range of options considered or all of the findings presented in any individual report.

A REVIEW
OF SELECTED
FEDERAL
VACCINE AND
IMMUNIZATION
POLICIES



Environmental Contaminants in Food

Pest Management
Strategies
in Crop Protection

SELECTED
TOPICS
IN FEDERAL
HEALTH
STATISTICS

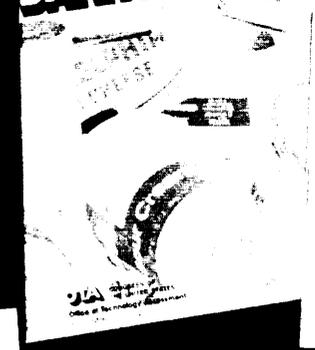
COMPUTER
TECHNOLOGY
IN MEDICAL
EDUCATION AND
ASSESSMENT

OPEN SHELF-LIFE
DATING OF FOOD

Drugs
in Livestock Feed

Technical Options for
Conservation of Metals

Case Studies of Selected Metals
and Products



materials and
energy from
municipal
waste



Resource Recovery and Recycling
From Municipal Solid Waste

Age Container Deposit Legisla



The
Direct Use of Coal



Management of Fuel
and Nonfuel Minerals
in Federal Land

Current Status and Issues

Analysis of Laws Govern
Access Across Federal La
Options for Access in Alaska



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fects of
uclear War

Technology
and East-West Trade



Technology Assessment of
Changes in the Future Use
and Characteristics of the

AUTOMOBILE
TRANSPORTATION SYSTEM

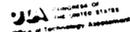
Summary and Findings

Technology Assessment of
Changes in the Future
Characteristics of

AUTOMOBILE
TRANSPORTATION SY

Public Participation

RAILROAD SAFETY—
U.S.-CANADIAN COMPARISON



Section II

SUMMARIES OF OTA REPORTS

COMPLETED IN 1979

Access Across Federal Lands in Alaska

Rarely has the conflict between resource development and protection of the natural environment been more severe than in Alaska. The largest State is a treasury of natural beauty, wildlife, and wilderness on a scale that does not exist in the rest of the Nation. At the same time, it has an abundance of natural resources that may be needed in the future. For decades, distance, climate, and lack of development combined to enforce de facto preservation of Alaska's natural treasures. The barriers that have protected Alaska's environment have been lowered by technology, by local development, and by an increased demand for resources.

Analysis of Laws Governing
Access Across Federal Lands
Options for Access in Alaska



Access across federally owned lands in Alaska is one of the keys to developing mineral and other natural resources in the State. The debate centers on how much mineral development is to be carried out and what is required to protect America's last virgin environment from such development. Resolution may require a combination of several access options—a combination that could be determined on the basis of priorities Congress establishes for the use and preservation of these lands.

OTA conducted a comprehensive analysis of Federal laws, regulations, and policies that currently affect access across federally owned lands to non-Federal lands (including State, Native, or private lands). OTA's report focuses on Federal land management laws, and particularly on those relating to access in Alaska.

Based on information about the location of mineral deposits, projected landownership patterns, and transportation availability, it was found that the need for rights-of-way is a localized problem that is likely to occur infrequently. However, if mineral resources on State, Native, or privately owned lands are to be developed in isolated regions of Alaska, access across Federal land would be required.

Under existing Federal land management laws and policies, access is available across most units of the public lands and national forests, except designated wilderness and wilderness study areas. Access across units of the national wildlife refuge systems is allowed if it does not pose a threat to protected wildlife. Because of the high degree of protective management afforded parks, wild and scenic rivers, and wilderness areas, use of these lands for access to non-Federal areas or for transportation routes is strictly limited. In park and refuge wilderness areas, an act of Congress would be required to allow any significant access. In all systems, but particularly the more protective, the availability of access may well turn on the factual issue of whether alternative routes or means of access exist.

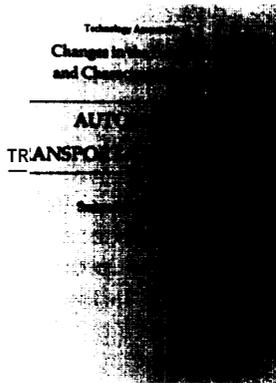
In providing access across federally owned lands, Congress could: 1) apply existing access provisions to Alaska lands; 2) defer action on access until mineral or transportation studies are completed; 3) provide limited right-of-way authority for access to non-Federal lands, or provide for land exchanges or realignment of borders to accommodate access needs; 4) authorize rights-of-way for future transportation systems, designate specific corridors, or establish a new Federal-State commission to review proposed rights-of-way; or 5) protect Alaska lands over and above existing statutes by requiring specific congressional approval for access use.



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The Future Use and Characteristics of Automobiles

If chronic worldwide oil shortages do not intervene, projections show that cars will continue to dominate personal travel in the United States through the year 2000. Cars provide a degree of comfort, convenience, and personal mobility unparalleled in history, and make a major contribution to the U.S. economy. The 100 million private cars now account for more than 90 percent of personal travel. But their use also helps consume dwindling



world oil supplies, pollute the atmosphere, congest roads, and kill thousands and injure millions annually.

A shift from petroleum to other energy sources for cars will be necessary sooner or later. Candidates include oil shale, tar sands, gasohol, coal liquids, and electricity from coal, nuclear, or solar energy generating plants. At the present time, all of these alternatives cost more than petroleum, and it is not certain which will prove to be technically or economically best. At least one or two decades will be needed to switch cars from petroleum to alternate energy sources, a process that might be aided by more R&D, tax incentives, or subsidies.

Meanwhile, current Federal programs to reduce gasoline use can keep total consumption at or slightly below present levels. Further reduc-



Photo credit U.S. Department of Transportation

... automobiles will continue to be the dominant mode of personal transportation through the year 2000 ...

tions can be achieved through smaller and lighter weight cars, requiring new cars to average 35 miles per gallon by 2000, and more fuel-efficient engines such as turbines or diesels. Increased gas taxes and/or price deregulation would reduce demand, but a several-fold overall price increase would be needed to cut the number of miles driven by 20 to 25 percent.

While auto emissions nationwide are expected to drop sharply from 1975 levels, air quality in many urban areas will be little better by 2000 than it is now because of more cars and congested streets as well as pollution from other sources. Tightening new car emission standards would be costly and reduce auto pollution only marginally. More effective measures might include a nationwide program to inspect and maintain emission control devices, restrict cars in specific areas at certain times, and encourage development of electrically powered cars.

Although the rate of traffic fatalities per mile driven has been cut by nearly 40 percent since 1966, there will be more deaths, injuries, and property damage per year by 2000 than there are now as more people drive more cars more miles. Safety could be further enhanced by strict enforcement of the 55-mph speed limit and pro-

grams to reduce drunk driving, improve occupant restraints, and build more crashworthy cars and roads. As a first step, the Federal Government might establish stringent and quantitative safety goals.

The entire automobile system will continue to cost governments, manufacturers, and consumers more—costs the Federal Government may be called on to help defray. State and local governments may need assistance to repair deteriorating roads. Similarly, tax incentives might help the auto and fuel industries meet Federal energy, safety, and environmental standards. Measures that might assist automobile owners include national no-fault insurance, regulation of repair practices to keep costs down, and incentives to manufacturers to build more durable and maintainable cars.

The Future Use and Characteristics of Automobiles: Public Participation

Americans want a transportation policy, not a “car v. transit” policy. Policy should emphasize mobility, not automobility. Popular supposition to the contrary, the American public is not having a “love affair” with the car, rather they “love” the mobility afforded by automobiles. Mobility is a right of the citizenry, not a privilege. These are some of the views expressed by 1,300 citizens who took part in a nationwide public participation program conducted in conjunction with an OTA assessment of “Changes in the Future Use and Characteristics of the Automobile Transportation System.”

The participants did not limit their comments to automobiles; they were concerned with personal transportation as a whole. They saw cost as a main constraint to mobility at the household level. At the national level, roadway maintenance and repair were seen as the main transportation costs for the future. Most of the participants viewed further major road construction in the United States as unnecessary.

The “energy crisis” was described as a political dilemma, not a true resource shortage. Conser-



Photo credits Bob Dunsmore and Vicki Sibley

Involving the public—citizens from the east to west coasts provided valuable input to the public participation process

vation is needed, but the Federal Government must provide the impetus, probably through regulations, participants said. They emphasized the need to develop alternative fuels and more fuel-efficient modes and devices.

Environmental protection was seen to be needed, particularly in the areas of air quality, noise, and land use. Existing environmental legislation should be better enforced, and there should be “more room for local initiative” in dealing with environmental problems, participants stated.

Drivers were described as the chief automobile safety problem, although road and vehicle improvements were judged necessary and desirable. Uniformity of traffic regulations and strict enforcement throughout the country were stressed. The majority of the participants favored the 55-mph speed limit, but they were divided

over the issue of federally mandated occupant restraint systems, such as seatbelts.

Mobility problems, such as providing transportation for the handicapped and elderly, are institutional, rather than technical, according to the participants. The Federal Government’s credibility—on the energy supply situation, for example—is low, and its management record poor, was a commonly expressed view. On the other hand, many participants described industry as “manipulative of public attitudes,” “profit mongering,” and “slow in innovation.”

When asked how they would design the personal transportation system of the future, the composite response was:

- Adequate mobility for everyone at affordable costs.
- A multifaceted system, not heavily dominated by one mode.
- Well-coordinated intermodal connections.
- Energy-efficient, nonpolluting, quiet, comfortable, accessible, safe, and durable modes.

The Direct Use of Coal

Coal is the only domestic fuel whose use can be greatly expanded with current economics and technology, and known resources. However, no other energy source evokes such memories of environmental and social damage. While many of these problems have been addressed, a number of uncertainties remain about both coal’s rate of growth and resulting impacts. If required for national energy purposes, coal production and combustion could be as much as tripled by 2000 without relaxation of environmental, safety, and health standards. However, demand is unlikely to grow at such a pace as long as other fuels are available.

The Direct Use of Coal



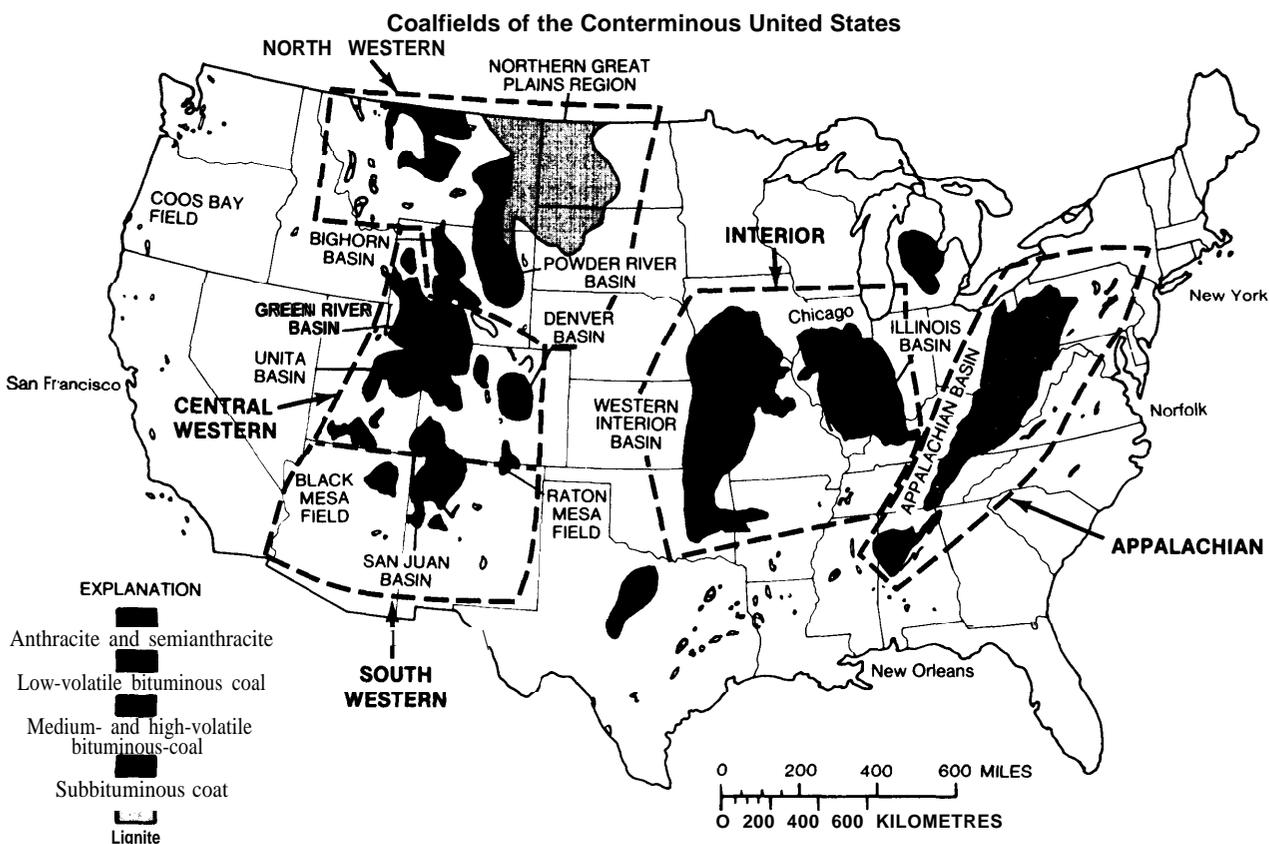
PROGRAM AND POLICY OF PRESIDENT AND SENATE
USA
DEPARTMENT OF ENERGY

Present or pending measures to mitigate coal's adverse impacts need not directly impede its use, but they will add to its cost and reduce its competitiveness. For example, reducing sulfur emissions may add a half cent to each kilowatt-hour produced. Policies aimed at increasing coal's use to reduce dependence on other fuels (e.g., imported oil and nuclear power) must therefore involve cost incentives. Technological developments would also allow smaller users (industrial and residential) to turn to coal. Inadequate transportation systems, Federal leasing policies, public opposition, or labor disputes could become supply constraints if policy initiatives lead to a tripling or even greater growth rate of demand.

If coal again becomes the preeminent energy source, it will be in a vastly different manner than before. Recently enacted Federal and State laws and regulations, combined with new technology to prevent pollution, restore strip-mined land,

and improve mine and health conditions, should prevent a repeat of at least the worst of coal's past impacts—soot-laden cities, scarred landscapes, ruined waterways, and frequent accidents and disease among miners. The key to minimizing coal's negative impacts lies with strict enforcement of current standards. However, some may be found to be inadequate when gaps in our information are filled.

Three major environmental uncertainties remain. Carbon dioxide, produced when fossil fuels are burned, could cause significant changes in climate. If so, massive increases in coal use may be unacceptable. Second, exposure to low levels of coal-related air pollutants may lead to thousands of premature deaths annually. Finally, acid rain appears to result from air emissions and can cause significant ecological damage. These concerns are the subject of much scientific dispute and warrant further study.



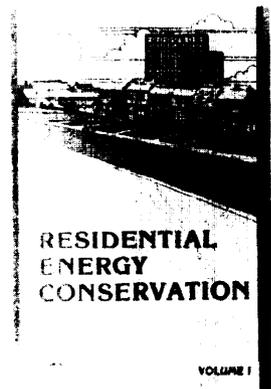
SOURCE P Averitt, *Coal Resources of the United States*, Jan 1, 1974. U S Geological Survey Bull , 1412, at 5 (1975)

Fatal accidents in mines have dropped dramatically since safety laws were enacted in 1969, but the rate of disabling injuries suffered by miners has not declined. As many as 42,000 miners could suffer serious injury annually by 2000. Respiratory diseases (collectively known as "black-lung" disease) are expected to become less prevalent, but the rate of illness is uncertain because the adequacy of current dust standards and the degree of compliance with them are not known.

Coal will also have significant impacts on the communities where it is mined. Increased underground production in Appalachia may require a doubling of the number of miners by 2000, which will further press areas already strained by decades of poverty and inadequate municipal services. Rapid growth of production in the West will create several dozen "boom towns," but the number of people involved will be less than in the East.

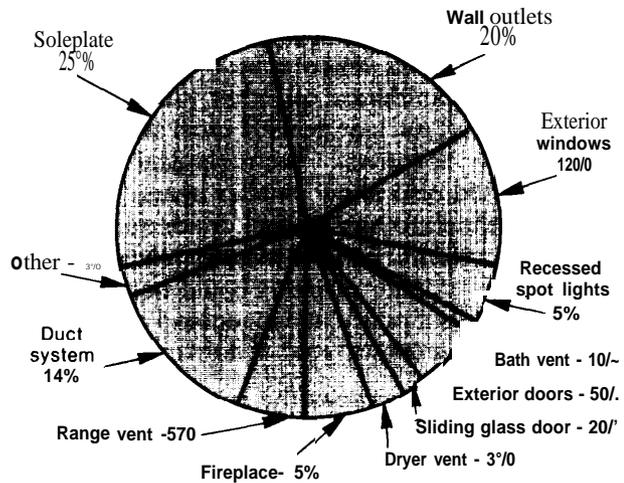
Residential Energy Conservation

Careful use of current technologies can cut energy use in new and existing homes and apartments by 50 percent or more with no loss in personal comfort or change in lifestyle. The equivalent of 19 billion to 29 billion barrels of oil could be saved by 2000 if people invested in their homes to the point of maximum dollar saving. Thus, conservation can effectively combat both rising energy costs and fuel scarcity.



Apparently in response to rising energy prices, Americans have reduced the annual growth rate for residential energy use from 4.6 percent in the 1960's to 2.6 percent in the 1970's. This change has been accomplished through better energy habits, and other improvements that make homes more energy efficient. Residential energy use can be kept at or slightly below current levels over the next two decades if conservation improvements continue.

Air Leakage Test Results for Average Home of 1,780 Sq. Ft. (50 homes tested by Texas Power & Light Co.)



SOURCE: "Reprinted with permission from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers."

Although requiring an initial investment, conservation will help hold down utility and fuel oil bills. The amount of energy and money saved depends on the skill and ingenuity of homeowners, remodelers, and builders. In some new houses, an investment of \$1,500 to \$2,000 could reduce the size of the heating and cooling systems required, thus actually lowering the first cost of the house. Substantial savings can also be accomplished in the Nation's 80 million existing residences. For low-income families living in substandard housing, the best approach appears to be subsidizing energy efficiency by upgrading the quality of their housing.

The amount of energy used in a given home depends to a large extent on the attitudes, choices, and behavior of its occupants. Studies show that consumers are motivated more by a desire to save money than by appeals for personal sacrifice, which may be counterproductive. Simply making more specific information available on how energy and money can be saved would help tremendously. One way would be to have trained inspectors point out to people how much energy their homes use. Surveys also show that consumers trust information from State and local authorities and community groups more than that from the Federal Government or large energy companies.

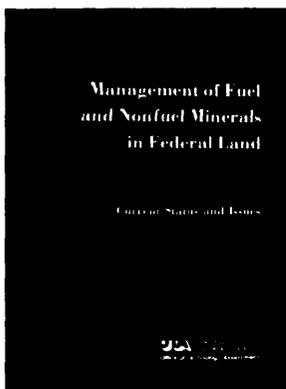
While a variety of Federal programs and incentives already encourage home energy savings, more could be done. Building codes and performance standards can be tightened to encourage the already clear effort of the industry to make homes more energy efficient. Federal home loan and mortgage guarantee programs can induce lenders to review energy costs with prospective buyers. Improved conservation in federally owned and subsidized housing could set an example. expand the market for conservation products, and improve the comfort of residents. To be effective, Federal programs need to be flexible to meet local requirements and variations in climate.

Improving home energy efficiency does have economic, environmental, and institutional impacts. For instance, conservation redirects money from fuel to goods, thus increasing employment. As homes become tighter, they require proper ventilation, without heat loss, to eliminate potentially dangerous concentrations of pollutants inside the house.

Much of the responsibility for making conservation work will fall on State and local governments, which need technical assistance and training programs as well as flexible guidelines from the Federal Government.

Management of Fuel and Nonfuel Minerals in Federal Land

The Federal Government owns about 30 percent of the land in the United States, almost all of it located in areas in the West and in Alaska that have been and are expected to remain major sources of both fuel and nonfuel minerals. However, large tracts of Federal land have been made unavailable for mining in recent years by Congress and the executive branch to protect wildlife, scenic areas, petroleum reserves, and recreational



areas, among others. These withdrawals could cause mineral production to decline in another 10 to 20 years.

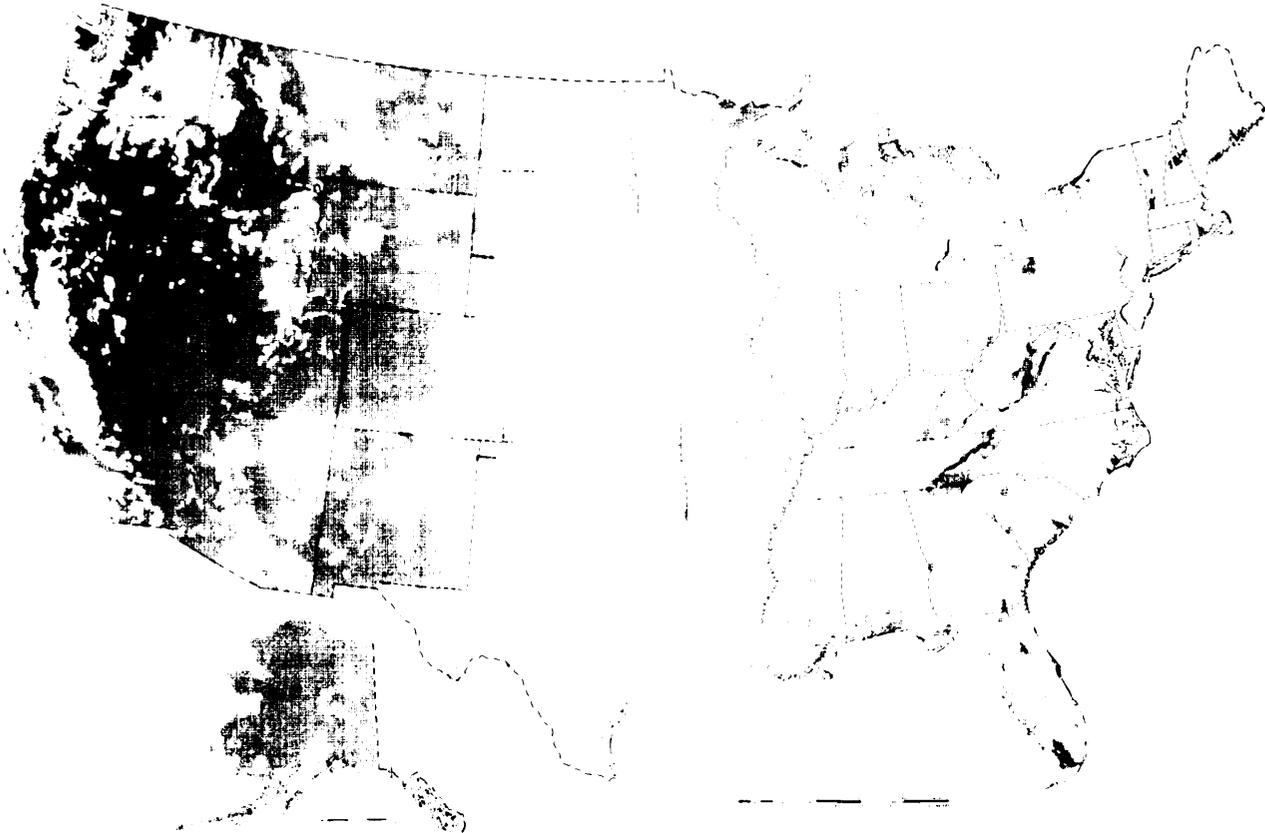
These withdrawals and other restrictions on mining activity in Federal lands have been in response to the fact that mineral rights, once obtained, take precedence over all other land values. Current law lacks incentives or other mechanisms to ensure a balance between mineral and nonmineral values at each stage of mining from exploration through production. Also, those who explore for and develop minerals are not required to pay for most damage to surface land or non mineral resources.

Enacted piecemeal over more than a century, Federal laws pertaining to mining and minerals are ill-suited for modern mining operations as well as for multiple-use concepts of Federal lands. They contain significant gaps in coverage, treat physically similar lands or mineral deposits differently, contain provisions that unnecessarily add to the cost and uncertainty of mining, and impede exploration for and production of more than one mineral. Access to Federal land for mining, as well as continued tenure once access has been obtained, are likewise uncertain. Further, the conditions under which tenure is granted are insufficient to ensure diligent mining activity.

Responsibility for mining and mineral leasing is split among various Federal departments and agencies. This split impedes efficient, integrated management of both mineral and nonmineral resources. For example, the agency responsible for managing surface lands often lacks authority to control the surface impacts of mining. On the other hand, the present division of authority between the Federal and State governments seems to be working well, although further improvements would be helpful.

Although designed to enable mineral-producing States to cope with the social and economic impacts of mining, Federal mineral revenues are made available to the States without their having to make any show of need. These revenues have rarely been used to mitigate the social and economic impacts of mining. The States' own powers to tax minerals are sufficient to deal with mining's impacts. Most States have not created

Principal Federal Landholdings in 1976



SOURCE U.S Geological Survey, Special Maps Branch, 1977
 Note: Alaska is shown here at a reduced scale

Includes areas of interspersed ownership containing at least 25-percent Federal land.

mechanisms to ensure that their mineral-derived revenue reaches those areas that need it in a timely manner, particularly during the preproduction stages. Some State taxes are so high as to inhibit mining and cause inefficient use of mineral and nonmineral resources in areas where mining occurs.

A number of options are available to Congress to coordinate mining with other land values, to improve the division of management responsibility for Federal lands, and to encourage efficient mining activities. These range from maintaining the status quo, to making moderate or major changes in each existing mineral law, or to comprehensive revisions of existing management systems.

The Effects of Nuclear War

The effects of a nuclear war that can be anticipated but cannot be calculated are at least as important as those that analysts attempt to quantify. Moreover, there are very large uncertainties regarding the effects that are calculated. Nuclear weapons are usually described by the damage they can inflict even in the most unfavorable circumstances. In fact, the casualties and economic destruction caused by a nuclear attack would

The Effects of Nuclear War

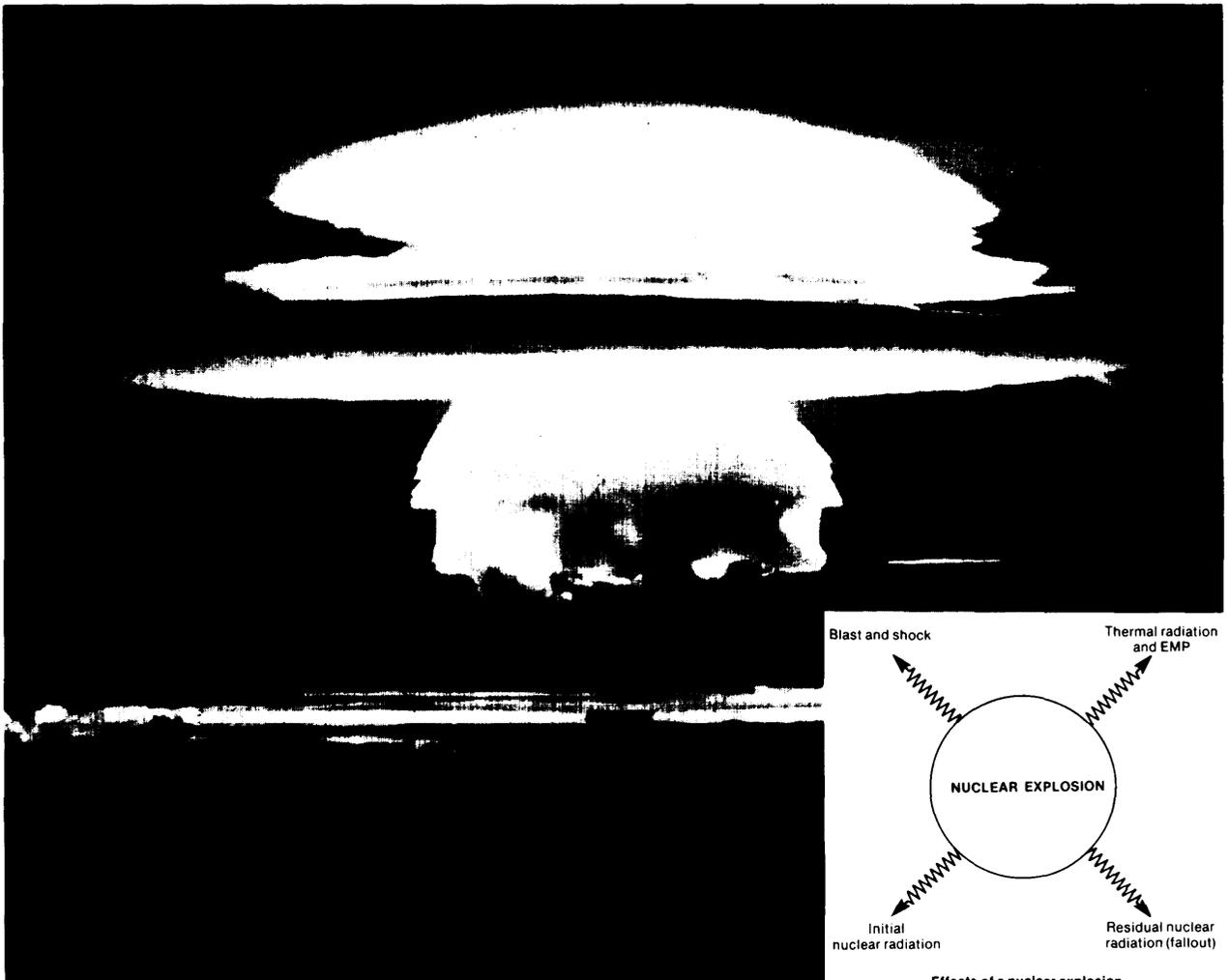


probably be far greater than most prior estimates have indicated.

In the period following a nuclear attack, conditions could get worse before they started to get better. The Nation would be far weaker—economically, socially, and politically—than a calculation of its assets would seem to indicate. People could live off prewar supplies and habits for awhile, but patterns of behavior would be changed by worsening shortages and the enormous psychological shock a nuclear war would produce. A failure to achieve economic viability (production equaling consumption) before stocks ran out would cause many additional deaths, and

further economic, social, and political deterioration.

A large-scale nuclear exchange between the United States and the Soviet Union could kill more than 250 million people in those two countries alone. The numbers killed in the first few days would depend on the exact number of nuclear weapons used and places of detonation, the time of year, extent of warning, and the weather. U.S. deaths would probably range between 70 million and 160 million, while Soviet deaths would be between 50 million and 100 million. Many “survivors” would die later from starvation, exposure, or disease, particularly in areas where the immediate deaths were relatively low.



Thermonuclear ground burst

Effects of a nuclear explosion
Photo credit U S Department of Energy

A "limited" nuclear exchange would have enormous impact as well, even if there were no escalation. An exchange limited to 10 MIRVed missiles aimed at oil refineries, for example, could kill 5 million Americans and destroy 64 percent of the U.S. refining capacity and 73 percent of the Soviet capacity. An attack directed solely at missile silos could kill as many as 20 million Americans. Despite the deaths and destruction of such attacks, their consequences might be enduring and economic recovery possible since they would be on a scale with previous wars and epidemics.

Major differences between the United States and the Soviet Union affect their relative vulnerability to nuclear attacks. People in the United States are more exposed than those in the Soviet Union because the latter are more dispersed geographically, and because U.S. weapons are generally smaller than their Soviet counterparts. Further, the Soviet political system is better able to maintain tight control in emergencies. However, the U.S. economy appears to be less vulnerable than that of the Soviet Union, both because it is bigger and better to begin with, and because Americans are more accustomed to decentralization.

Nuclear war is deterred by the certainty of its enormous effects, and by the uncertainty about just what those effects would be. Even a limited nuclear war could be expected to kill millions of people and inflict damage on a scale unprecedented in U.S. history, while a large-scale nuclear exchange would be a calamity unknown to human history. Because the economic, social, and political effects are literally incalculable, no government could predict with confidence what the consequences of even a limited nuclear attack would be.

Federal Health Statistics

The number and types of Federal data systems for health statistics have increased dramatically in recent years as an outgrowth of the expanded Government role in health care. Indeed, virtually every new Federal program pertaining to health needs data. Hence, there has been a rapid proliferation of data projects that relate to specific health programs.

SELECTED
TOPICS
IN FEDERAL
HEALTH
STATISTICS

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF HEALTH STATISTICS

The fast growth of Federal statistical projects has led to problems of fragmentation, overlap, and duplication. Data systems cannot be easily adapted to issues that cut across jurisdictional responsibilities because they are dispersed among different health programs. The number of health data projects has exacerbated the decentralization of Federal health statistics, thereby making planning and coordination difficult. Too much data are collected on some subjects, too little on others. The inability to link and integrate diverse data files for analyses that require more than one data source makes it difficult to assess program achievements or compare results. Also, data projects designed for specific health programs often do not meet the needs of all potential users.

Most data on health are collected by the Department of Health, Education, and Welfare (HEW), principally by its Public Health Service and the Health Care Financing Administration. The Public Health Service alone operated 153 data projects in 1977—a one-quarter increase over the previous year. Another 13 projects were

run by the Health Care Financing Administration. The total cost of Federal health statistics in fiscal year 1977 has been estimated at \$100 million. These estimates are probably low, however, because many projects go unreported.

Congress usually does not assess the impact of data requirements mandated by its laws. A single statutory requirement may necessitate a number of costly data projects involving many respondents. However, an agency's resources and internal priorities, rather than legislation, often determine the scope of its data collection activities.

Lacking an overarching set of principles and objectives for health statistics, the Federal Government needs a coherent policy for coordinating health data systems. An administrative unit could be created to coordinate the collection of health data. If created, it should have sufficient authority to plan data systems, improve the collection of information, and ensure that potential users have access to data. A number of offices within HEW could provide this function, although additional staff and money would be needed to carry it out. The fundamental requirement in assigning administrative responsibility is an unambiguous mandate to manage health statistics.

As part of the study of Federal health statistics, OTA compiled a directory of laws that authorize HEW to collect health data. The directory provides a listing of existing statutes that can be referred to by Congress before passing new laws that require collecting health data. [t can also assist executive agencies plan and coordinate data projects for health.

Drugs in Livestock Feed

For the past three decades, drugs have routinely been added to livestock feeds to promote animal growth, make feed more efficient, and prevent disease. Forty percent of the antibacterial drugs (antibiotics plus chemicals with similar actions) made in the United States are used in animal feeds or for other nonhuman purposes. Also, most of the meat produced in the United States has been fattened with the aid of drugs



Animals given certain antibacterial in concentrations lower than those used to treat disease have been found to gain weight faster and with less feed than animals not given those drugs. Low levels of antibacterial apparently promote growth and feed efficiency through the prevention of disease or direct metabolic effects. In addition, other drugs, such as the synthetic hormone diethylstilbestrol (DES), are used to promote growth either as feed additives or as implants under the animal's skin.

However, widespread concern has been expressed about the potential health effects from this use of drugs. First, evidence indicates that disease-causing bacteria now resist many antibacterial drugs, including penicillin and tetracycline. Second, use of these antibacterial in animals may contribute to their declining effective-

ness in humans. Third, some drugs used to promote animal growth, particularly DES and furazolidone, an antibacterial drug, have been shown to cause cancer in humans and/or animals.

It is the widespread, continuous use of low doses of antibacterial that favors the growth of drug-resistant bacteria. Resistance can be transferred from one type of bacteria to another, from animal to human bacteria, and from one antibacterial drug to another. As a result, drugs used to treat human illness lose their effectiveness. However, the amount of drug resistance attributable to antibacterial used in animal feed cannot be measured precisely. In addition, residues of drugs used to promote livestock growth may persist in retail meat products, where some could cause cancer when consumed by humans. The extent of the risk is unclear because scientists lack definitive methods to translate laboratory results into the number of people who might contract cancer.

The Food and Drug Administration (FDA) has proposed to ban DES and the nitrofurans, to limit penicillin to treatment of known diseases, and to restrict tetracycline to such treatment if alternatives are available to promote growth and feed efficiency. In fact, FDA-approved alternatives for most of these drugs are already available. The risk of illness to humans posed by continued use of antibacterial, as well as the degree and economic impact of decreased meat production that would occur from restricting or banning these drugs, cannot be measured precisely.

In addressing the problem of drugs in livestock feed, Congress could: 1) allow FDA to regulate drug use, subject to congressional oversight; 2) require FDA to make economic as well as scientific assessments of benefits and risks; 3) modify the special approach required for cancer-causing drugs; 4) require FDA to decrease the use of antibacterial in humans and livestock feed; and/or 5) require that in the future only those drugs that have proven more effective than those now in use be approved.

Materials and Energy From Municipal Waste

Americans now generate more than 135 million tons of municipal solid waste (MSW) every year. Its disposal is a growing problem in those areas of the country where traditional methods such as open dumping, landfill, uncontrolled incineration, and ocean burial are too expensive or environmentally unacceptable.

Yet, these wastes contain materials whose use would help conserve resources. MSW includes more than two-thirds of the national consumption of paper and of glass, over one-fifth of the aluminum, and nearly one-eighth of the iron and steel. Recycling these materials requires less total energy than does the use of new resources. If the combustible portion of MSW were burned, the energy produced would be equivalent to almost 2 percent of the Nation's annual energy use.

Nearly all the materials recovered for recycling from MSW today have been kept separate as they were generated ("source separation"). Source separation programs can produce sizable revenues and energy savings, but have a limited effect on the total solid waste stream. Depending on local conditions, a combination of source separation and centralized resource recovery (see below) may be an optimal approach from an economic point of view.

Materials can also be recovered by separating mixed wastes in a central facility. A limited number of commercial technologies are available for producing energy and recovering materials in such a system. Other technologies are in the developmental stage. Because costs are frequently



higher than revenues, resource recovery has the greatest economic potential where both alternative disposal methods and energy prices are high, such as in the urban Northeast. Relatively small plants appear more economical and easier to provide than larger ones. The Federal Government could help overcome the risks of resource recovery by funding basic research and a limited number of demonstration projects.

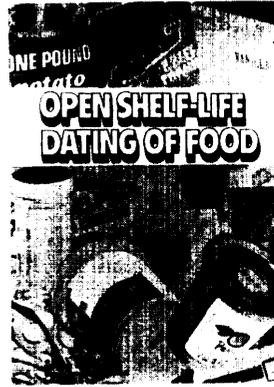
Potential markets exceed anticipated recovery through 1995 for iron and steel, aluminum, paper, and energy. Glass markets are developing rapidly. However, the prices users will pay and the quality they demand could be barriers to sale of large amounts of recovered resources.

A Federal product charge or a Federal recycling allowance could lead to greater recycling and lower waste generation, but pose administrative difficulties. Repeal of virgin material tax preferences, adjustment of railroad freight rates for scrap, a severance tax, and Federal procurement of recycled materials would be less effective. Additional Federal support for R&D on uses of recovered resources would be useful; development of specifications for trade in recovered materials needs only limited additional Federal help.

Federal beverage container deposit legislation would save energy; reduce materials use, solid waste generation, and littering; and protect the environment. It would lead to a net increase in employment, but with a loss of existing jobs in the materials and container industries. Brewers and bottlers would experience higher operating costs, but lower container costs. Wholesalers' and retailers' costs would increase. It is not clear whether net costs or consumer prices of beer and soft drinks would increase or decrease.

Open Shelf-Life Dating of Food

Concerned that the food they buy is not always fresh or nutritious, consumers have advocated in recent years that sellers clearly state on food packages the dates by which a given item should be sold or eaten. Referred to as "open shelf-life dating," this technique theoretically could help increase consumer confidence in the freshness of food, encourage better handling of food products by retailers, and reduce nutrient loss. To aid with inventory control, the food industry now uses coded dates that consumers cannot understand.



Three types of dates could be placed on food packages: the date of packaging, the date by which products should be sold, and/or the date by which they should be used. While providing little information to consumers, the "pack date" is the easiest and least expensive for the food industry to adopt. The "sell-by date" provides retailers greater control over their inventory, but does not tell consumers when food should be either eaten or discarded. The "best-if-used-by date" gives consumers the most relevant information, but would be the most costly to implement and difficult to scientifically verify. No consensus exists on which type, or combination, of dates would be best.

Currently, nobody knows whether open dating would improve the freshness of foods being sold. Foods are classed as perishable, semiperishable, and long shelf life. Scientific data are adequate to

determine freshness dates for some foods, mainly perishables, but not for all. Food quality is affected by a number of factors, including temperature, humidity, light, and time. Some foods spoil or lose their freshness faster than others; some change appearance with time, but remain nutritious.

Even though no Federal law mandates it, 21 States and the District of Columbia have adopted some form of open dating. These systems as well as the voluntary ones put into effect by the industry vary widely as to the foods to be dated, what dates are used, and what those dates mean. This lack of a uniform dating system leaves consumers confused. More needs to be known about the effects of dating systems now in use.

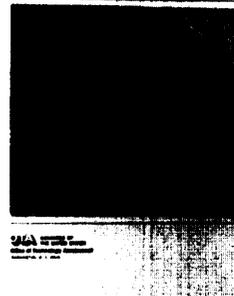
Nobody knows exactly how much open dating would cost. OTA estimates the cost to producers of establishing open dates at about \$100,000 for each perishable food product and \$200,000 for those that remain fresh longer. This startup plus continuing costs might add from one-tenth of a cent to 1 cent to the price of a package on the store shelf. More data are needed to determine the costs of dating specific products.

In addressing the issue of food dating, Congress could: 1) take no action, thus allowing the present voluntary system to continue; 2) establish a mandatory system that would specify open dates; or 3) adopt a mix of voluntary and mandatory systems, in which the Federal Government develops guidelines for dating, but allows processors greater flexibility to determine dates and minimize costs. A mandatory system would produce greater uniformity, but would be more difficult and expensive to implement. A mixed system could provide for uniformity and allow industry to decide whether to open date products. The procedure could be varied for different food categories—mandatory dates for perishables and mixed for all others, for example.

Railroad Safety: U.S.-Canadian Comparison

A comparative analysis of U.S. and Canadian railroad derailments, fatalities, and safety practices indicates many similarities and some significant differences between the two systems. The differences result primarily from the larger size and complexity of the U.S. system.

RAILROAD SAFETY— U.S.-CANADIAN COMPARISON



The U.S. fatality rate for the 1966-76 period was an average of 48 percent higher than that of Canada. This large

difference, especially at grade crossings and among trespassers, seems to reflect the higher level of U.S. exposure to rail hazards that occurs because the U.S. population and rail system are considerably larger than Canada's.

While derailment rates vary widely among U.S. carriers, the average derailment rates for the nine largest (in ton-miles) U.S. carriers were similar to those of the Canadian railroads for 1976 and 1977. However, the average derailment rates for the second 10 U.S. railroads are significantly higher than the rates for the Canadian railroads for those same years. The financial picture of some U.S. railroads may give rise to their significant derailment rates. Derailments in the United States are continuing to increase, while derailments in Canada have stabilized or declined slightly. The continued rise, particularly among carriers below the top 10, in U.S. derailments appears to result from increased axle loadings on freight equipment and deferred maintenance. U.S. derailment rates will probably continue to increase until the economic condition of some railroads improves. In both countries less than 2 percent of rail-related fatalities occur in derailments.

The National Transportation Act of 1967 in Canada changed its Government's economic policy toward transportation modes. As a result, railroads gained greater control over their rate structure. Although no direct correlation could be drawn between this change in economic policy and rail safety in Canada, the change may influence rail safety.

Several Canadian approaches to rail safety may be of interest in the United States. These include:

- emphasis by railroad management on safety accountability, and adoption of a systematic approach to safety;
- creation of a no-fault system of insurance compensation for work-related injuries;
- use of risk analysis in inspections and in allocation of grade-crossings funds;
- Government use of stop orders rather than monetary fines as a means of enforcing safety standards;
- use of a standard Hazardous Information Emergency Response form; and
- encouragement of a nonadversarial relationship between labor and management in the formulation of safety programs.

A Review of Selected Federal Vaccine and Immunization Policies

Since 1967, the number of active vaccine manufacturers has declined 50 percent, and the number of licensed vaccine products has declined 60 percent. For each of 19 types of licensed vaccines, including poliovirus vaccine, the United States is dependent on a single American pharmaceutical company. Some investigators believe the decline in vaccine manufacturers and products is partly the result of Federal policies.

A REVIEW
OF SELECTED
FEDERAL
VACCINE AND
IMMUNIZATION
POLICIES

BASED ON CASE STUDIES OF
PNEUMOCOCCAL VACCINE



To evaluate the safety and efficacy of newly developed vaccines, the Federal Government relies heavily on data collected from premarketing clinical trials. Government evaluations based on such data can be less than comprehensive. The Government does not require anyone to collect postmarketing data regarding adverse reactions to licensed vaccines.

Medicare cannot pay for vaccinations to prevent infectious diseases, although it does pay for the treatment of such diseases. Thus, Medicare cannot pay for the use of pneumococcal vaccine, even though the Federal Government spent \$6.5 million to help develop this vaccine and approved its use among the elderly. According to OTA's cost-effective analysis, vaccination against pneumococcal pneumonia would be more cost-effective among the elderly than among any other age group, and for all age groups would yield health benefits that cannot be obtained from treatment.

Liability problems may be eroding the commitments of vaccine manufacturers, Congress, and State health departments to public immunization programs. Some courts have ruled that the vaccine manufacturer should compensate injured vaccinees because: 1) the manufacturer was best able to pay and 2) no other applicable compensation mechanism existed in society. In order to warn potential vaccinees about possible vaccine side effects, HEW has developed informed consent forms and guidelines to be used by State and local participants in federally sponsored immunization programs. If HEW and the vaccine manufacturers successfully discharge their "duty to warn" obligations, however, then injured vaccinees may have no legal recourse to compensation.

Some actions Congress could take to help ensure the Federal Government's promotion of safe and effective vaccines include: 1) establishing an interagency body to review comprehensively all Federal policies that affect vaccine development, evaluation, and use; 2) authorizing the Federal Government either to produce or subsidize the production of selected vaccines; 3) requiring the

Government to monitor actively adverse reactions to licensed vaccines; 4) amending the Medicare law to permit Federal reimbursement for vaccinations among the elderly; and 5) developing a Federal program for compensating vaccinees who are seriously injured in public immunization programs.

Conservation of Metals

The United States has experienced shortages in critical metals in recent years and become in-

creasingly dependent on foreign sources of supply. The United States now imports 50 percent or more of such metals as aluminum, chromium, manganese, and tungsten. By cutting the large amounts of loss or waste of metals along the materials cycle—from mining of ore to product disposal—the

United States could ease both shortages and the dependency on imports.

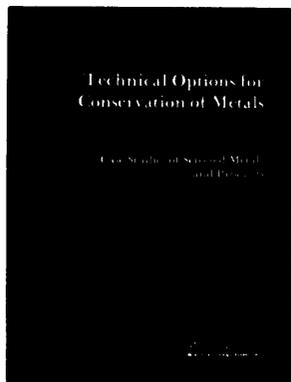
Of all the options for cutting metals waste, product recycling—the remanufacturing, reuse, and repair of end products—offers the greatest leverage for saving materials and energy now wasted. Product recycling could save 30 percent or more of the copper, aluminum, iron, and steel now lost. Environmental impacts associated with mining and manufacturing would also be reduced. Product recycling already exists in such areas as auto parts, furniture, typewriters, and aircraft. However, product recycling is currently far below its potential.

The major barrier to more widespread product recycling is economic. To be economically attrac-

ive, used products must usually be reworked or remanufactured at a cost that will permit a resale price significantly lower than that of new products. Products for which recycling is likely to be economic are those with higher initial costs, whose appearance or styling is of secondary importance, that can be recycled on a production-line basis, and for which there is a steady, large supply of products for remanufacture. Other major barriers to increased product recycling are the lack of established industries to collect, remanufacture, and resell the product, and the preference of consumers for new products.

Product recycling could be encouraged by a variety of means, including increasing public confidence in recycled products, providing funding to establish a scrap inventory, providing loans to establish an aftermarket business, and encouraging product leasing. Increased use of recycled products could have the short-term effect of reducing net jobs and replacing unskilled jobs with those requiring somewhat greater skill. However, the long-term impact would likely be to increase consumer buying power and net jobs.

The substitution of less critical metals or nonmetals is another important option for saving selected metals. However, several major impediments must be overcome. First, a successful substitution can often take years to implement. Second, many products are manufactured with a highly specialized production process that is costly to change. Third, every substitution involves a risk that will add to the product cost. One option to encourage substitution would be Government R&D to develop practical substitutes for selected metals, with particular emphasis on high-volume usage, nonmetallic coatings for corrosion and wear resistance, and inherently nonrecyclable uses. This option could also encourage private sector R&D.



Computer Technology in Medical Education and Assessment

This background report describes the use of computer technology across a variety of medical education, practice, and evaluation activities and summarizes some of the changes that computers will bring to medicine.

COMPUTER
TECHNOLOGY
IN MEDICAL
EDUCATION AND
ASSESSMENT

BACKGROUND REPORT

There have been dramatic reductions in the size and costs of computers. At the same time, advances in medicine have led to a vir-

tual information explosion, making the contemporary medical care system more complex, more information-dependent, and more technology-oriented. Computers can add to the increasing complexity of medicine as well as assist in efforts to more effectively understand, employ, and manage the information and array of technologies used in health care. They have rapidly become integral to teaching and testing in many of our medical schools and have assumed growing importance in patient care, in epidemiologic and clinical research, and in medical administration.

Thus, computers are rapidly changing the nature and function of medical education and practice and the ways in which performance is evaluated. This led to self-paced, independent study programs in the pre-clinical years of medical school, specialty certification examinations which can reflect the patient-physician encounter more accurately than written examinations, and computerized data bases which can improve the physician's diagnostic and therapeutic skills.

The implications arising out of these medical uses of computer technology include changes in

the method and content of physician education, improved methods of measuring and validating the quality of medical care, and more individualized testing of physician performance. Individualized testing will accelerate already existing trends to assess competence only in limited areas, which in turn will raise questions concerning whether physicians should have licenses limited to their specialties and concerning the relationships between State licensing boards and the private specialty boards in regulating physician practices.

Pest Management Strategies in Crop Protection

A sharp step-up in the current slow shift to integrated pest management (IPM) for major U.S. agricultural crops can cut pesticide use by as much as 75 percent in

some cases, reduce pre-harvest pest-caused losses by 50 percent,

and save a significant amount of the one-third

of the world's potential food harvest that is lost to all pests. (The pests include noxious and damaging organisms

such as insects, mites, nematodes, plant pathogens, weeds, and vertebrates. Pesticides include insecticides, miticides, nematicides, herbicides, and fungicides.)

IPM involves the coordinated use of a variety of control tactics to prevent economic losses from pest damage while minimizing hazards to humans, animals, plants, and the environment. IPM is the most promising approach to U.S. crop protection over the next 15 years. The international implementation of IPM requires systems that are adopted to local agricultural conditions,

social customs, political structures, and economic systems.

U.S. crops have become increasingly vulnerable to pest damage. The present limited number of pest control tactics within the categories of chemical, cultural, plant resistance, and biological are neither completely effective nor universally applicable. The intensive use of only one or two of these tactics can create hazards to human and environmental health and increase pest resistance to controls. Therefore, American agriculture is gradually shifting to IPM strategies, which apply the most broadly effective combination of available methods to particular pest problems. However, technological and administrative obstacles block rapid development and use.

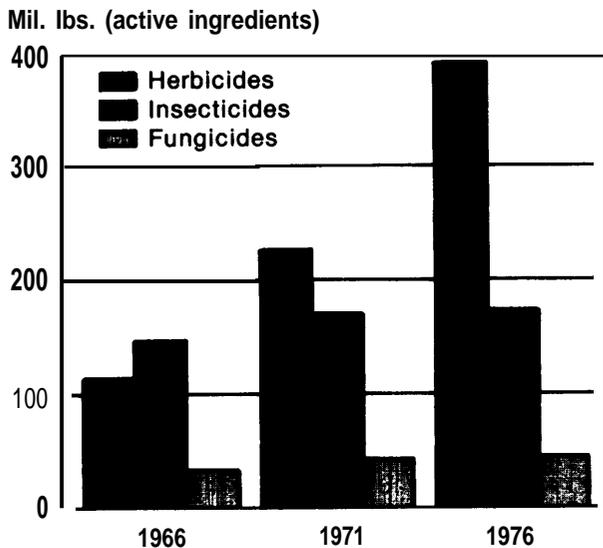
Among the obstacles to rapid adoption of IPM strategies are:

- inadequate knowledge in basic biology, interactions of crop pests, and the economics of pest management,
- the lack of an adequate system for disseminating the information needed to make sound pest management decisions,

- a shortage of trained personnel to conduct research, develop IPM programs, and deliver the needed information,
- the lack of coordination and cooperation among Federal and State agencies, and
- the lack of a clear and common commitment to and agenda for future IPM activities by agencies involved in the funding of research and extension activities, the regulation of pesticide use, and the marketing of farm products.

The basic option before Congress is whether or not to commit the additional resources needed to speed up the current evolutionary movement toward adopting IPM crop protection systems. Congress can: 1) support the status quo for U.S. pest control which, although including IPM, continues to rely heavily on chemicals or 2) develop a strategy for accelerating the shift to IPM. With a modest increase in resources, IPM could replace most unilateral pest control programs over the next 20 to 30 years. With a major effort to remove the obstacles to IPM, the shift could be made within 15 years.

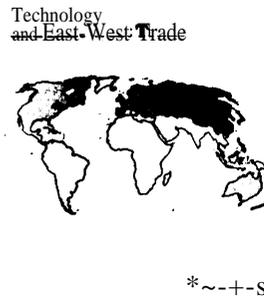
Volume of Pesticides Used on U.S. Farms



SOURCE Adapted from 1978 *Handbook of Agricultural Charts*, USDA Agriculture Handbook #551

Technology and East-West Trade

Although Western technology contained in civilian products sold to the Soviet Union has contributed to its military potential, it is unlikely that any unilateral action of the United States could have prevented this—or could do so in the future. Almost any high technology, even though its purpose and function is civilian, may have some military use. U.S. export controls do a good job of preventing



the transfer of primarily military technologies to the Communist world, 'but a conclusive determination of the degree of military risk entailed in the sale of these so-called "dual-use" technologies is probably impossible. Existing multilateral arrangements designed to minimize that risk work reasonably well.

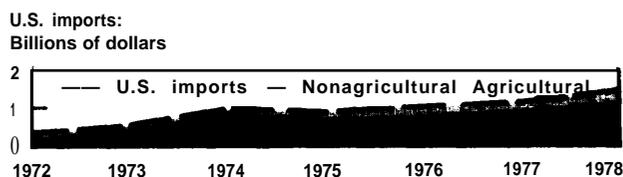
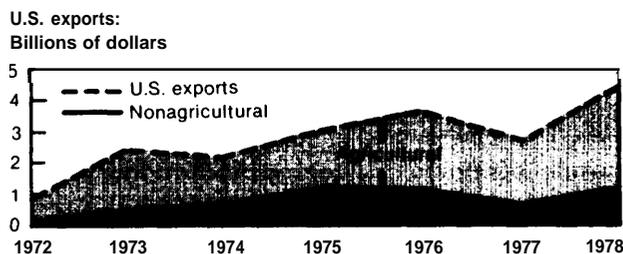
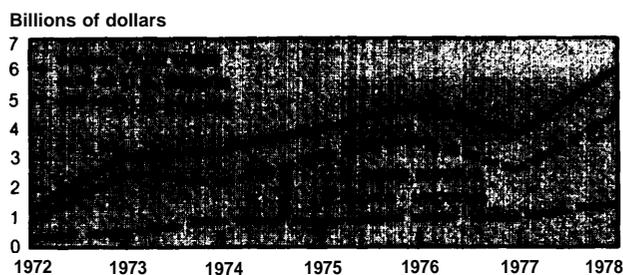
These are among the conclusions of a new OTA report *Technology and East-West Trade*. The report looks not only at the military, but also the political and economic costs and benefits to the United States of trading—especially in technology—with the Communist world. It reviews the controversy over whether such trade can or should be used to obtain foreign policy leverage. It also examines the East-West trade policies of four of America's major allies—West Germany, France, Great Britain, and Japan—and finds them significantly different from that of the United States. Finally, it provides background information on existing U.S. export policies and regulations, and on the use which Communist nations have made of Western technology.

Trade with the Communist world plays a relatively small part in U.S. foreign trade. The absolute value of Communist trade with Western nations is low and the United States has captured only a minor share of that limited market. The policy most likely to increase the U.S. share of trade with Eastern-bloc countries is the extension of official credits to those Communist nations currently ineligible for them. In the long run, however, dramatic growth in the total volume of East-West trade is contingent on an increase in the ability of the East to export to the West.

East-West trade has always been economically more important for Western Europe and Japan than for the United States. While our allies do not deny the basic necessity of withholding items of direct military relevance from Communist nations, they generally do not share the concerns expressed in the United States over the political, military, and strategic implications of transferring dual-use technologies. In Japan, West Germany, France, and Great Britain, the sale of technology is seen as primarily an economic issue and any use of export controls for political purposes is largely eschewed.

Because of its position of leadership in a number of technologies of critical military significance, the United States may legitimately feel it has a special responsibility to ensure their safekeeping. If it can play this role with intelligence and integrity, the United States may be able to initiate and maintain a strong and unified Western-bloc position on the transfer of military technologies.

U.S.-Eastern* Trade, 1972-78**



● Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, U. S. S. R., and PRC.

..1978 trade estimated imports do not include U.S. imports of nonmonetary gold from U.S.S.R.

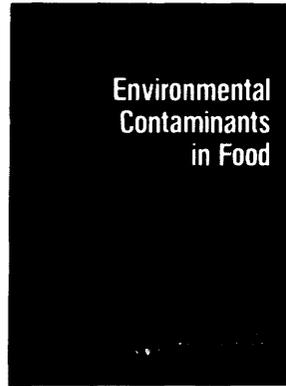
SOURCE Selected Trade and Economic Data for the Centrally Planned Economies, U S. Department of Commerce, 1979

However, the United States is not the sole source of most of the dual-use technologies desired by Communist nations and this foreign availability constrains its unilateral influence over their transfer.

In sum, it appears most unlikely that actions taken by the United States alone could lead to: 1) a dramatic increase in our trade with the East, 2) a dramatic decrease in the military risks associated with existing trade, or 3) a significant reduction in the technologies the East can purchase, given the existing attitudes of other Western nations.

Environmental Contaminants in Food

Environmental contaminants in food have become a nationwide problem. Between 1968 and 1978, according to an OTA survey, 243 food-contamination incidents were reported in this country. (Environmental contaminants include organic chemicals, metals and their derivatives, and radioactive substances, that inadvertently enter the human food supply through agriculture, mining, industrial operations, or energy production.)



Although the United States has escaped mass poisonings such as have occurred in other industrialized nations, nearly all U.S. residents carry detectable residues of some environmental contaminant in their bodies. Studies indicate that some contaminants present at low levels in U.S. food cause physiological changes in humans, but the long-term significance of these changes is uncertain. Between 1968 and 1978, at least \$282 million in food was lost to contamination. This conservative estimate only includes 30 percent of the known incidents and ignores hidden costs such as medical expenses and lost workdays.

Although the Federal Food, Drug, and Cosmetic Act (FFDCA) contains no specific provisions for environmental contaminants, FDA has set permissible levels (either "action levels" or "tolerances") for all known contaminants. FDA relies on informal action levels more than formal tolerances because tolerances can only be set

through complex, time-consuming procedures. FDA is not required to review these informal judgments, nor to commission new toxicological studies even when available data are inadequate. When setting regulations FDA attempts to balance the cost of the food lost against the degree of public health protection gained.

Federal and State monitoring of food is primarily regulatory, designed to ensure that environmental contaminants do not exceed prescribed action levels or tolerances. Consequently, contamination involving unregulated substances is rarely identified before it becomes a major problem. None of the major environmental contamination incidents in this country (PBB, PCB, kepone, and mercury) were initially discovered by ongoing monitoring programs. In each case, actual human or animal poisonings—either at home or abroad—alerted authorities to the danger.

Managing contamination incidents can be difficult because the Federal and State agencies involved sometimes do not coordinate their activities. Efforts are hindered further by the complexity of the American food system and the rapidity with which food is moved through the system.

In light of these findings, Congress could: 1) allow the present system to continue; 2) amend FFDCA to require the establishment of tolerances, simplify administrative procedures through which tolerances are set, clarify the weight economic criteria can have, and/or grant FDA authority to set regional tolerances; 3) establish a national monitoring system to detect unregulated chemicals in food; and/or 4) designate a lead agency to establish a center to orchestrate the delivery of Federal assistance to affected areas.