

# Section II.-Year in Review

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The assessments carried out by OTA cover a wide spectrum of major issues that Congress and the country are facing. A brief summary of each report, published by the Office during the year\* is presented in this section. The reader is cautioned that these are synopses of reports. They do not cover the full range of options considered or all of the findings presented in any individual report.

## Wood Use: U.S. Competitiveness and Technology

The United States could greatly expand its role in world forest products trade over the next decade and become a net exporter of solid wood and paper products before 1990. For the past 30 years, the United States typically has imported more forest products than it has exported. However, because exports have grown faster than imports, the trade deficit has narrowed. This trend is likely to continue.



Wood Use  
U.S. Competitiveness  
and Technology



Global demand for a wide range of forest products is growing rapidly, and the best trade opportunities for U.S. producers appear to be in the paper markets of other industrialized nations, particularly Western Europe and Japan. In contrast to many basic U.S. industries, the forest products industry has distinct advantages over its foreign competitors. It is the most productive and among the most efficient in the world, benefiting from a vast and highly productive domestic forest resource.

To capitalize on international trade opportunities, the forest products industry and the Federal Government probably will have to make concerted efforts to promote exports. Although responsibility for developing foreign markets rests primarily with the private sector, Government action could assist in overcoming trade barriers which currently inhibit the competitiveness of U.S. wood products in foreign markets.

Past Government and private sector concerns regarding a possible domestic timber shortfall no longer seem justified. Future timber needs, especially for housing but also for other products, probably have been overestimated. The effects of intensive timber management and the ability of wood utilization technology to stretch the wood resource, have probably been underestimated.

If current trends toward more intensive forest management continue, domestic needs for wood probably can be met without dramatic price

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\*This OTA Annual Report represents a transition from calendar year reporting to fiscal year reporting. It therefore covers the period January 1 through September 30, 1983.

increases. To achieve the full economic potential of U.S. forestlands, however, some changes in policy would be needed, as would an estimated investment of \$10 billion to \$15 billion in intensive timber management over the next 35 to 50 years,

Although both the Government and private sectors are now investing in intensive timber management, it is unlikely that current trends will lead to full utilization of U.S. forests. Although the Federal Government does provide financial and technical assistance to nonindustrial private landowners, who own nearly 60 percent of the Nation's commercial timberland, this assistance is often limited by budget constraints and is not necessarily targeted to lands most capable of providing increased timber supplies. Greater emphasis on small-scale forestry research, technical assistance, education, and information programs, combined with more accurate channeling of such assistance to the most suitable recipients, could stimulate private forest productivity.

Under the guidance of the National Forest Management Act of 1976, the U.S. Forest Service periodically prepares programs for and assessments of the Nation's renewable resources. These programs, however, provide little analysis of policies and programs not administered specifically by the U.S. Forest Service, although there are many Federal, State, and local agencies which influence timber supply from public and private lands. The need for increased investments in forest productivity and research and development will be easier to establish with national timber production goals to serve as a guide.

Formulation of forest policy requires up-to-date information about forest acreage, inventories, and growth trends, and realistic assumptions about future demands for forest products. Improvements in the current system for estimating prospective timber supplies and demands are needed if decisionmakers are to have adequate information for design and funding of timber management programs, private landowner assistance, and research needs.

Existing and emerging technologies enable a broad range of wood products to be manufactured from currently underutilized hardwood species and from waste wood material. Expanded research in basic wood chemistry and engineering properties, and research on utilization of hardwoods and waste wood, could increase wood's long-term competitive position relative to other materials, as well as the competitiveness of the U.S. forest products industry. Increased research on hardwood and waste wood utilization could also extend U.S. wood supplies,

Commercial timber production is only one of the many uses for U.S. forestland. Broad-scale intensive forest management may result in increased soil loss, altered wildlife habitat, reduced water quality, and lower soil productivity. The environmental impacts of intensive forestry are not well understood, and further research on its effects will be needed if the practice becomes more widespread.

Significant changes in Federal programs and policies probably are not required to ensure that future domestic forest products needs are met. However, OTA has identified four general policy options which Congress could consider to increase the domestic and international competitiveness of the forest products industry:

1. Encourage research and development of forestry-related and wood utilization technologies, particularly small-scale forestry research suited to the needs of nonindustrial private landowners, basic wood chemistry and physical properties research, hardwood and waste wood utilization, and research on the environmental effects of intensive timber management.
2. Assist exporters through negotiated reduction in barriers to trade, including tariffs, quotas, and nontariff barriers.
3. Promote the use of U.S. wood products and building techniques overseas, using the Foreign Agriculture Service's experience in agricultural export promotion as a model.
4. Improve the quality of information needed for forest policy formulation. The greatest information needs are for up-to-date timber growth and inventory trends and improved forecasting methods which provide decisionmakers with realistic ranges of possible future timber supply and demand.

### Industrial Energy Use

For many years to come, energy need not constrain economic growth in the United States. OTA projects that over the next two decades, investments in new manufacturing processes,



a shift to less energy-intensive products, and technical innovation will lead to substantially increased energy efficiency. At the same time, these improvements will increase industrial profitability and competitiveness. As a result, OTA projects that the rate of industrial production can grow considerably faster than the rate of energy use needed for that production.

Corporate investment decisionmaking appears to recognize this link between productivity and energy efficiency. All corporate projects are evaluated in terms of product demand, competition, cost of capital, cost of labor, energy and materials, and Government policy. Energy-related projects are only part of an overall strategy to improve profitability and enhance a corporation's competitive position. OTA has found that corporate capital projects directed solely at improving energy efficiency are not given special status, although energy cost is an important consideration in investment decisions.

OTA examined the four most energy-intensive industries in the U.S. manufacturing sector: paper, petroleum refining, chemicals, and steel. Historical energy use was analyzed, new technologies identified that could improve energy efficiency, and future energy demand projected. In the paper industry, energy use has risen slightly since 1972, but the industry is now more energy self-sufficient. In 1981, the pulp and paper industry generated half of its energy needs from wood residues.

From now through 2000, projections for the petroleum refining industry show a decline in product output, but continued, if only slight, improvement in energy efficiency. Efficiency gains will be offset by a shift to high-sulfur, heavier crude oil feedstock, and a need for additional processing of raw materials to meet market demand for high-octane, unleaded gasoline.

Projections for the chemicals industry indicate an increase in energy efficiency through a combination of technological improvements to existing process equipment, technical innovation in developing new processes, and a shift from commodity chemicals, such as chlorine, to less energy-intensive specialty chemicals, such as pharmaceuticals.

As the steel industry rebuilds to meet foreign competition, production will grow slowly, and will show a large reduction in energy intensity due to greater use of two new processes: the replacement of ingot casting by continuous casting, and the substitution of electric arc furnaces for the blast furnace/basic oxygen furnace combination of traditional steelmaking.

OTA examined four policy options for their effects on industrial energy use. Two options were directed specifically at energy conservation investments, while the remaining two were aimed at stimulating all investment.

OTA's findings suggest that the most effective Government policies to promote the efficient use of energy are not those specifically targeted to energy use, but those that improve the economic outlook and investment climate by lowering interest rates and expanding demand for goods and services. Specifically, OTA concludes that:

- Reduction in capital costs would be the most effective means of stimulating investments that increase energy efficiency. It would also enhance the effect of the recently enacted accelerated cost recovery system (ACRS).
- ACRS depreciation is a positive stimulus to investment, and thus to energy conservation. But, this effect is only significant when industry is profitable and growing.
- Energy investment tax credits at a 10-percent level have little direct influence on capital allocation decisions in large American firms, and thus have little or no effect on energy conservation. However, energy investment tax credits aimed at third-party financing of energy production, such as cogeneration of steam and electricity, would be effective,

- A tax on premium fuels would stimulate investment in energy-efficient processes and products but would also have negative effects. For example, a premium fuels tax would increase the chemicals industry's vulnerability to foreign competition and adversely affect product sales of the petroleum refining industry.

### Technology and East-West Trade: An Update

The recent controversies over trade sanctions and export controls have focused attention on the Export Administration Act, whose renewal is now before Congress. *Technology and East-West Trade: An Update*, discusses a range of legislative proposals in terms of four key policy perspectives:

Technology  
and East-West Trade  
An Update



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- national security: making Soviet acquisition of militarily relevant Western technology as difficult and costly as possible;
- foreign policy: safeguarding the President's flexibility in using export controls to advance U.S. foreign policy interests;
- efficiency: making the licensing system more predictable, consistent, and efficient to enable U.S. exporters to plan ahead and to increase compliance; and
- trade promotion: reducing trade restrictions, especially foreign policy controls.

Some of these views are mutually compatible. For example, it is perfectly possible to strengthen national security controls while promoting flexibility in foreign policy controls. Some combinations, however, are inherently in conflict. The conflict between national security and export promotion is obvious, but there are others. For example, the very existence of foreign policy controls over exports introduces an element of unpredictability into export licensing, which works against both efficiency and trade promotion.

The perceived importance of national security controls has risen, as evidence has accumulated that the Soviets have a coordinated and effective program to obtain and exploit Western technology for military purposes. Soviet efforts include both legal and illegal transfers. More effective administration and enforcement of existing controls may be more productive than controlling additional items or categories.

While U.S. trade with the U.S.S.R. is small and likely to remain so, it is important for particular sectors (e. g., grain) and firms (e. g., Caterpillar). Retroactive and extraterritorial controls may have an adverse impact on West-West trade, which far exceeds East-West trade in importance to the United States.

The embargoes on grain and oil and gas technology dramatically illustrate the difficulties of a policy of trade leverage against the Soviet

Union. The sanctions did hurt vulnerable sectors of the Soviet economy, but probably not enough to make a real economic difference. In fact, although such calculations are highly uncertain, the sanctions may have done more damage to the U.S. economy than the Soviet economy. Nor did they change Soviet behavior. The Soviet Union may even have benefited from the public display of Western disunity following the imposition of the pipeline sanctions, which were applied to preexisting contracts of U.S. subsidiaries and licensees based overseas.

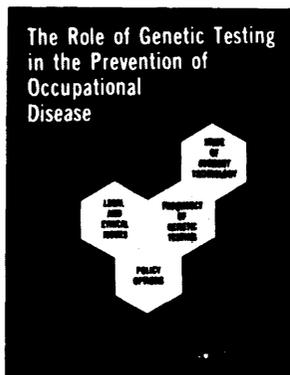
Moreover, tight U.S. export controls require the cooperation of our Allies to have a real effect on the U.S.S.R. Allied cooperation works reasonably well only where there is agreement on what should be controlled. Despite their agreement to conduct policy studies on East-West trade, there is little evidence that the West European countries and Japan will endorse the Reagan administration's position. Their future trade relations with the U.S.S.R. will be shaped more by their own domestic imperatives and worldwide economic forces than by U.S. concerns.

Although the principal issues remain much the same, the stakes in East-West trade have escalated since 1979, when Congress passed the Export Administration Act. Congress was unwilling then to make consistent choices between the goals of national security and export promotion. The result was ambiguous legislation, which has allowed Presidents Carter and Reagan to pursue their own policies, in each case giving foreign policy considerations priority over U.S. export trade.

This report is an update of a more comprehensive OTA report published in 1979.

## Role of Genetic Testing in the Prevention of Occupational Disease

Genetic testing in the workplace is an emerging technology that could help reduce occupational disease, but there is concern about its potential misuse. Although none of the genetic tests



evaluated by OTA meets established scientific criteria for routine use, existing evidence suggests the value of further research. Routine use of genetic testing, however, would raise significant legal, ethical, and policy questions.

Occupational disease has a serious and far-reaching impact both on society as a whole and on individuals. Genetic testing may be helpful in reducing the incidence of disease resulting from exposure to chemicals and ionizing radiation (e.g., X-rays). The testing encompasses two types of techniques. Genetic screening involves examining an individual

for certain inherited genetic traits on the assumption that the traits may predispose the person to disease when he or she is exposed to potentially hazardous chemicals. Genetic monitoring involves examining a group of workers for environmentally induced changes in the genetic material of certain cells in their bodies. The underlying assumption is that the changes indicate exposure to hazardous agents (chemicals or radiation) and that the group may be at an increased risk for disease. The information that might be provided by genetic testing would allow employers or employees to take preventive actions, but some people fear that it could result in employees being unfairly excluded from jobs.

Because of conflicting accounts about the extent of testing in the workplace and the use of the results, OTA surveyed the Fortune 500 industrial companies, the 50 largest private utilities, and 11 major unions representing the largest number of employees in these companies. Of the 366 organizations responding, 6 currently were using one or more tests. 17 used some of the tests in the past 12 years, 4 anticipated testing in the next 5 years, and 55 stated they possibly would test in the next 5 years. Actions taken as a result of testing ranged from informing an employee of potential problems to changing or discontinuing a product. In view of the small number of organizations testing and inherent methodological limitations in the survey, generalization of the results to the entire survey population or US. industry as a whole is not warranted.

Although the law has generally not dealt with genetic testing, many existing legal principles are directly applicable to the issues raised by this technology. An employer is responsible for workplace safety, but would not be required to use genetic testing. Under the Occupational

Safety and Health Act of 1970, the Secretary of Labor could require genetic testing, if the techniques were shown to be reliable and reasonably predictive of future illness, or could regulate testing, but only in relation to employee health. The act grants no direct authority to protect employees or job applicants from employment discrimination.

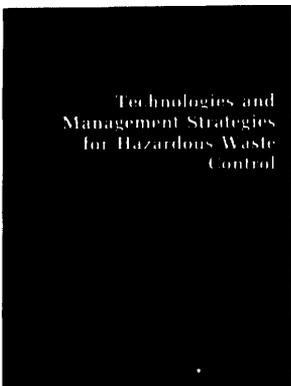
Job applicants or employees who were victims of adverse job actions because of their genetic makeup may have some rights under Federal and State antidiscrimination statutes, and, if genetic makeup were considered a handicap, under the Rehabilitation Act of 1973.

Ethical principles provide some guidance for the appropriate uses of genetic testing. Because of the low correlation between genetic traits or genetic damage from exposure and disease, it would be unethical, for instance, for an employer to deny an applicant a job because of test results.

Congress could take a number of specific actions to promote or control genetic testing. The options include funding additional research for the development of more reliable and predictive tests and constraining employment actions that may be taken on the basis of genetic testing.

### Technologies and Management Strategies for Hazardous Waste Control

The Environmental Protection Agency's (EPA) regulations do not assure consistent nationwide levels of protection for human health from the potential effects of massive annual accumulations of hazardous waste.



These regulations for hazardous waste management do not effectively detect, prevent, or control the release of toxic substances into the environment, particularly over the longer term. Yet every year 1 metric ton (tonne) of hazardous waste is added to the environment for every individual in the Nation. Moreover, financial restraints and lack of technical resources will make it difficult for States to fulfill their increased responsibility for waste management policy.

Industry and government are spending \$4 billion to \$5 billion annually to manage the approximately 250 million tonnes of regulated hazardous waste generated each year. The annual costs are expected to rise to more than \$12 billion (in 1981 dollars) in 1990. Some States have stricter definitions for hazardous waste than the Federal program, which regulates about 40 million tonnes annually.

As their responsibilities mount, States fear reductions in Federal support and seek a stronger policy role. States sometimes cannot raise even the required minimum 10 percent of initial Superfund cleanup costs—and they must assume all future operation and maintenance costs.

Because there are no specific Federal technical standards for determining the extent of Superfund cleanup, and because there is an incentive under EPA rules to minimize initial costs, remedial actions may be taken that will prove ineffective in the long term. Much of the \$10 billion to \$40 billion which will be needed for cleaning up the 15,000 uncontrolled sites of previous disposals so far identified maybe wasted. When Superfund expires in 1985, many uncontrolled sites still will require attention. It is estimated that only \$1,6 billion will be collected under Superfund by 1985 for cleanup of these sites.

Inappropriate disposal of hazardous waste on land creates the risk of contaminating the environment, including ground water, which could cause adverse health effects and for which cleanup actions are costly and difficult. As much as 80 percent of regulated hazardous waste—some of which may remain hazardous for years or centuries—is disposed of in or on the land.

In addition, millions of tonnes of federally unregulated or exempted hazardous wastes are disposed of in sanitary landfills (meant for ordinary solid wastes) and pose substantial risks. Such exemptions cover all types of hazardous wastes from generators producing less than 1 tonne a month, and other types of waste, such as infectious waste.

Current policies are likely to lead to the creation of still more uncontrolled sites which will require Superfund attention. The unregulated burning of wastes as fuel supplements in home and industrial boilers may result in toxic air pollutants.

Greater use of alternatives to land disposal could increase industry's near-term costs significantly. However, years or decades from now, cleaning up a site and compensating victims might cost 10 to 100 times today's costs of preventing releases of hazardous wastes.

Federal policies may reduce industry's costs of land disposal by shifting some long-term cleanup and monitoring costs to government or to society as a whole. The effect may be to retard the adoption by industry of alternatives such as waste reduction and waste treatment.

A key policy issue is: Can unnecessary risks and future cleanup costs be eliminated by limiting the use of land disposal, and by making alternatives to it more attractive?

The Federal regulatory program for hazardous waste management was established by the 1976 Resource Conservation and Recovery Act (RCRA), primarily concerned with the proper management and permitting of present and future wastes; and the Comprehensive Environmental, Response, Compensation, and Liability Act of 1980 (CERCLA), or Superfund, enacted to deal with the many substantiated and potential hazards posed by old and often abandoned uncontrolled hazardous waste sites. The OTA study supports the need for greater integration by EPA of these two programs.

## Policy Options

OTA has identified four policy options—beyond maintaining the current Federal program—which could form the basis for an immediate and comprehensive approach to protecting human health and the environment from the dangers posed by mismanagement of hazardous waste:

1. Extend Federal controls to more hazardous wastes, and establish national regulatory standards based on specific technical criteria. Also restrict disposal of high-hazard wastes on land and improve procedures for permitting facilities and deregulating wastes.
2. Establish Federal fees on waste generators to support Superfund and to provide an economic incentive to reduce the generation of waste and discourage land disposal of wastes; impose higher fees on generators of high-hazard wastes that are land-disposed; provide assistance for capital investments and research and development for new waste reduction and treatment efforts.
3. Study the costs and advantages of classifying wastes and waste management facilities by degree of hazard to match hazards and risks with levels of regulatory control.
4. Examine the need for greater integration of Federal environmental programs to remove gaps, overlaps, and inconsistencies in the regulation of hazardous waste, and to make better use of technical data and personnel.

## Key Issues and Findings

- Current monitoring practices and EPA requirements under RCRA—especially for land disposal sites—do not lead to a high level of confidence that hazardous releases will be detected and responsive action quickly taken.
- There are numerous technically feasible management options for hazardous wastes, but they are not being used to their full potential. On the whole, Federal programs indirectly provide more incentive for land disposal than for treatment alternatives that permanently remove risks, or for waste reduction—although technologies are available to reduce waste,
- States are being given increasing responsibilities by EPA without matching technical and financial resources. A lack of State funds often prevents Superfund cleanups. A Federal fee system on waste generators could also be used to support State programs. EPA should make better use of State data and expertise.
- Actions that enhance public confidence in the equity, effectiveness, and vigorous enforcement of government programs may reduce public opposition to siting hazardous waste facilities. Opposition may also be reduced by improvement in the dissemination of accurate technical information on issues such as waste treatment alternatives to land disposal,

- EPA's risk assessment procedures for selecting Superfund sites and for developing RCRA regulations have serious technical inadequacies that weaken protection of the public.
- Data inadequacies conceal the scope and complexity of the Nation's hazardous waste problems and impede effective control. There is a need for a long-term, systematic EPA plan for obtaining more complete, reliable data on hazardous waste, facilities, sites, and exposure to and effects from releases of harmful substances.
- Wastes can be classified into at least three categories of hazard and, combined with facility classes, might form a technical base for Federal regulatory policies.

### Industrial and Commercial Cogeneration

Cogeneration—the combined production of electricity and useful thermal energy—could contribute significantly to reduced costs and greater planning flexibility for electric utilities, and to increased energy efficiency in industrial facilities, commercial buildings, and rural/agricultural areas. But cogeneration's potentially large market will be limited by technical, economic, and institutional constraints. These include the difficulties in using lower cost solid fuels; competition with conservation measures; mismatches between the ratio of need for electric and thermal energy and the ratios typically produced by a cogenerating unit. The high cost of investment capital will limit opportunities further.



To achieve potential long-term benefits for electric utilities, cogeneration systems must use abundant solid fuels and produce high ratios of electricity to steam (E/S). But the available high E/S systems can use only oil or natural gas. Therefore, research and development efforts should concentrate on developing high E/S cogenerators that can burn solid fuels cleanly, and on advanced combustion and conversion systems such as fluidized beds and gasifiers.

Utility ownership could increase the amount of production as well as the reliability of cogenerated electricity. However, such ownership is at a competitive disadvantage because the Public Utility Regulatory Policies Act of 1978 (PURPA) limits qualifying projects to those in which a utility owns less than 50 percent equity. If the PURPA limitation were removed, concerns about the possible anticompetitive effects of utility ownership could be alleviated through careful State review of utility ownership schemes.

For the near term, natural gas will be the preferred cogeneration fuel where the marginal or avoided cost rates for utility purchases of cogenerated electricity are based on the price of oil, and where natural

gas is available. In the long term, however, natural gas is likely to be too costly for natural-gas-fired cogeneration to compete economically with electricity generated at central station coal, nuclear, or hydroelectric powerplants.

Cogeneration also must compete for investment capital with conservation, which reduces steam loads—and therefore cogeneration's technical potential—and which often has lower unit capital costs and shorter payback periods than cogeneration.

**Costs.**—The mean capital costs for commercially available cogenerators tend to be 20 to 40 percent lower per kilowatt than central station generating capacity. Also, the relatively small unit size and the shorter construction leadtimes of cogeneration systems mean substantial interest cost savings during construction, and greater flexibility for utilities in adjusting to unexpected changes in electricity demand than the overbuilding of central station capacity.

**Electricity Prices.**—Cogenerators have potentially lower unit costs for generating electricity than central station powerplants. However, these savings will not necessarily mean lower electricity rates if the price paid to the cogenerator—based on avoided costs—is higher than the utility's retail rates. A price that is less than the utility's full avoided cost, with the difference going toward rate reduction, would share any cost savings from cogeneration with the utility's other ratepayers, but would not provide the maximum possible economic incentive to potential cogenerators.

**Interconnection.**—The primary issues are the utilities' legal obligation to connect generators with the grid, the cost of the equipment, the lack of uniform guidelines, and the uncertain potential for utility system stability problems. Most of the technical aspects of interconnection are well understood, but additional research is needed to determine whether many cogenerators not centrally dispatched will cause utility system stability problems. If PURPA is not amended to require interconnection, and if utilities do not interconnect voluntarily, then the cost of obtaining an interconnection order from the Federal Energy Regulatory Commission could be prohibitive for many potential cogenerators.

**Air Quality Impacts.**—Cogeneration will not automatically offer air quality improvement or degradation compared to the separate conversion technologies it will replace. Rather, its impact will vary considerably from case to case. Adverse local air quality impacts from cogeneration are most likely to occur in urban areas,

## **TECHNICAL MEMORANDA**

### U.S. Natural Gas Availability: Conventional Gas Supply Through the Year 2000

Describes and evaluates alternative estimates of the conventional natural gas resource base of the lower 48 States; describes and interprets past and current trends in discovery and production of this gas resource; and projects a credible range of potential (conventional) gas production for the next 15 to 20 years.

### Quality and Relevance of Research and Related Activities at the Gorgas Memorial Laboratory

Examines the Gorgas Memorial Institute of Tropical and Preventive Medicine, Inc., and its research arm, the Gorgas Memorial Laboratory (GML). It focused on: the quality of research and related activities at GML, and the relevance of GML's work to Panama, tropical America, the United States, and the advancement of tropical medicine knowledge.

### Diagnosis Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology

Examines diagnosis related groups, their use in the Medicare payment system, and the potential impact on medical technology use and adoption and on technological change. Also examines the construction of DRGs, and discusses issues in implementation of the system.

### Habitability Issues Related to Love Canal

Based on a report published by the U.S. Environmental Protection Agency (EPA) in May 1982, which was reviewed by a multidisciplinary team of consultants for several Federal agencies, the U.S. Department of Health and Human Services judged the Love Canal, N. Y., to be "as habitable as the control areas with which it was compared." OTA critically reviewed EPA's habitability decision.

### Agricultural Postharvest\* Technology and Marketing Economics Research

Examines the role of the public sector in postharvest technology and marketing economics research. It describes the development of the public sector research effort; measures the cost, benefits, burdens, and quality of the research; presents guidelines for the public and private research participants; and evaluates the public sector management and policy programs.

### Unispace '82: A Context for International Cooperation and Competition

Discusses the issues that arose at this international conference, the positions taken by the United States, and the lessons that can be applied to future international cooperation and future civilian activities in space.

### Automation and the Workplace: Selected Labor, Education, and Training Issues

Discusses concepts for evaluating the impacts of manufacturing automation, and describes the conduct of education, training, and retraining for persons seeking or holding jobs in manufacturing industries.

## BACKGROUND PAPERS

### The Impact of Randomized Clinical Trials on Health Policy and Medical Practice

Provides materials about the history and conduct of randomized clinical trials (RCTS), a family of experiments designed to evaluate the efficacy and safety of medical technologies. It examines the levels of funding over time and the actual and potential use of RCTS in forming health policy. The paper also reviews the ways in which RCTS have affected different areas of medical practice. Finally, it draws together suggestions from the literature and from people knowledgeable in the field for more effective use of RCTS in policymaking and in improving the practice of medicine.

### Water-Related Technologies for Sustainable Agriculture in U.S. Arid/Semiarid Lands: Selected Foreign Experience

Highlights examples of water-related technologies that have been successfully applied in arid and semiarid foreign countries in a manner not being applied in the United States—integrated irrigation management in Pakistan, intensive water use planning in Israel, cooperative plant breeding in Senegal, native game ranching in Kenya, and guayule production in Australia.

### Sustaining Tropical Forest Resources: U.S. and International Institutions

Describes Government, academic, and private sector institutions in the United States that are developing or implementing technologies to sustain tropical forest resources.

### Sustaining Tropical Forest Resources Reforestation of Degraded Lands

Describes the state of the art in use of forestry technologies to restore the productivity of tropical lands that have been degraded because of human activity.

### Technology, Innovation, and Regional Economic Development: Census of State Government Initiatives for High-Technology Industrial Development

Identifies dedicated State government programs for high-technology firms.

### The Information Content of Premanufacture Notices

The study assesses the extent to which current premanufacturing notice submissions either fulfill or compromise efforts to perform the preventive health and environmental protection mandate of the Toxic Substances Control Act.

### Technology and Handicapped People, Background Paper #2: Selected Telecommunication Devices for Hearing-impaired Persons

Examines specific factors that affect the research and development, evaluation, diffusion and marketing, delivery, use, and financing of technologies directly related to disabled persons.

## **CASE STUDIES**

### Medical Technology and Costs of the Medicare Program: Variation in Hospital Length of Stay: Their Relationship to Health Outcomes

Examines evidence on how variations in length of hospital stay affect patient outcomes and the implications of changes in length of stay for quality of care, access, and Medicare program costs.

### Medical Technology and Costs of the Medicare Program Efficacy and Cost Effectiveness of Therapeutic Apheresis

Examines the scientific literature on the safety, efficacy, and costs of the therapeutic apheresis (a costly procedure used to treat an increasing number of medical conditions) with particular emphasis on implications for the Medicare program.

## Medical Technology and Costs of the Medicare Program: The Effectiveness and Costs of Alcoholism Treatment

Examines the evidence of alcoholism treatment in a variety of settings: inpatient care, outpatient hospital care, community-based treatment centers, etc., as well as the effectiveness of various methods of treatment (chemical aversion therapy, group therapy, and Alcoholics Anonymous).

### **WORKSHOP PROCEEDINGS**

#### Plants: The Potentials for Extracting Protein, Medicines, and Other Useful Chemicals

OTA conducted a workshop designed to identify technological opportunities and constraints for commercially developing protein, pharmaceuticals, chemicals, and other associated extracts from plants generally and tobacco specifically. OTA examined the potential impacts that such technologies might have on improving nutrition and food quality by increasing the availability of high-quality protein. Issues addressed include: quality of current data bases on chemistry of plant extracts; status of bioassay technologies; and social, economic, environmental, and political impacts that such new technologies might generate.