OTA Priorities—1979

(Ranked in order)

Priorities

IMPACT OF TECHNOLOGY ON NATIONAL WATER SUPPLY AND DEMAND

Problem. Freshwater is a vital renewable national resource. Although the Nation's overall freshwater supply is more than adequate, its distribution causes serious problems. Some areas get too much precipitation; others have too little.

Arid regions often resort to such dangerous alternatives as pumping supplies from aquifers faster than they can be naturally replenished. Unfortunately, the legal and economic web that regulates most water supplies— even in dry areas—often does not encourage the most efficient usage. Also, many individual States regulate water with an eye to their own needs—a practice which contrasts with some effective regional management schemes.

Projected demands for water for coal gasification, liquefaction, and mining; for cooling towers; and for irrigation exceed the projected supply in some States, Some alternative water supply technologies that merit study include surface water development, such as impoundments; groundwater extraction; and interchangeable ground and surface water systems. Others include conservation aimed at major water users, waste-water recycling, desalination, undersea aqueducts, and iceberg towing. All of these systems have social, economic, or environmental impacts that must be assessed.

The effects of overuse of available water supplies need evaluation. Depletion of ground-water supplies, land subsidence, lowering of the water table, and intrusion into aquifers by saltwater, minerals, salts, and sewage are all recognized to be problems.

OTA Role. An initial OTA study would concentrate on analyses of technology affecting future water supply and demand projections. It would also provide Congress with information needed to evaluate alternatives to current Federal water programs, and would explore possibilities for better coordinating the use of the Nation's freshwater supplies.

It would also consider the following issues:

- Possible trade-offs among water uses for energy manufacture, agriculture, and recreation.
- Conservation plans, including possible Federal action, conservation through pricing systems, recycling of water, and improved irrigation techniques.
- Water management, especially the roles of the Federal, State, and local governments in managing water resources.
- The development of a nationally consistent data bank.
- Cost-sharing proposals among governments and private users that might reduce water consumption or channel available supplies in appropriate directions.
- The impact of Federal and Indian water rights on local water issues.

Priorities (Continued)

ALTERNATIVE GLOBAL FOOD FUTURES

Problem. In the early 1960's the world enjoyed substantial food reserves. Carryover grain stocks primarily in the United States, amounted to about 95 days' worth of global consumption. In addition, American farmers were paid to hold out of production 50 million acres of cropland. By 1974, however, reserve stocks had declined to merely 26 days and Government payments to keep land idle had ceased. Although in the last 3 years grain stocks have again risen, the planet had moved from an era of relative food abundance to one of food scarcity.

Although improved weather conditions over the last 3 years have helped, there is still serious concern that the present global food system will prove increasingly inadequate over the next two to three decades. Even in the best of years with substantial reserves in some parts of the world, hundreds of millions of people who cannot pay for their food are malnourished. World population growth and rising energy costs are increasing the pressures on global food production and delivery systems. Furthermore, climatologists point out that the major increases in food production in recent decades have resulted in large measure from unusually favorable climate, which history indicates is unlikely to be sustained. Even the technologically advanced American farm is feeling the pressure. Increases in agricultural production are leveling off. Additional energy no longer produces increased yield. Capital and labor costs, along with increasingly scarce and expensive water, also point to a productivity plateau. This suggests that the world cannot continue to look to the United States as a supplier of last resort. One estimate of future food requirements asserts that in order to keep pace with population growth, developing countries will have to increase their food production by at least 4 percent per year over the next quarter century; however, present production increases are well below this.

OTA Role. The proposed assessment would examine the global food system in the context of a range of supply and demand projections. The three key elements of any food system are production, marketing and distribution, and consumption and nutrition. Affecting all of these, directly and indirectly, are the policies of the respective governments. Analysis of these requires consideration of a number of variables. Production is determined by factors such as the availability and quality of land, water, energy, labor, and capital; marketing and distribution involve processing, wholesaling, and retailing practices; a study of consumption must not only explore cultural preferences and the nutritional value of food, but also reflect the fact that nutrition is tied to work performance and output, population growth and family size, disease resistance, health, and mental development.

The analysis of these variables should reveal where the greatest vulnerabilities in the system lie and what forms a breakdown might take. Technologies that can strengthen the various components of the system would be assessed. These scenarios, together with analyses of their likelihood, technological requirements, and the long- and short-term impacts of these technologies, would provide Congress with the information necessary to develop and evaluate both domestic and foreign food-related policies.

Priorities (Continued)

HEALTH PROMOTION AND DISEASE PREVENTION TECHNOLOGIES

Problem. Major factors that determine health are environment, lifestyle, biology, and health services. Health services alone cannot cure degenerative and chronic diseases and injuries, our major killers. Great increases in health care costs and the absence of commensurate improvements in health status have heightened interest in health promotion and disease prevention technologies. Congress has been asked to fund a range of these technologies from control of environmental contaminants to health education. Little is known about the widespread impacts of adopting these particular technologies in health, the health care system, and society at large. Without such information, Congress is unable to fully address many health-related problems.

OTA Role. The issues surrounding health promotion and disease prevention technologies include their effectiveness, costs, allocation, payment, and long-term impacts on health, the health system, and society. One or more of these issues will be addressed in specific assessments. The areas currently being considered for in-depth examination are:

- Technology of carcinogenic risk assessment. Environmental agents are involved in up to 60 percent of human cancers. Are current technologies adequate to identify and to quantify risks? What options exist for improving risk assessment technologies?
- Emerging health promotion technologies. The use of new technologies outside of the traditional medical care system, such as meditation or biofeedback, is increasing. Are these technologies effective and safe? What are their costs?
- Methods to evaluate social technologies for health promotion and disease prevention. Social technologies, such as obesity control programs, promote lifestyle changes. What is the state of the art for evaluating these technologies? Are present evaluation methods adequate to determine their effectiveness? What should be the Federal role in these efforts?
- Preventive technologies in dental health: a case study. Dental or periodontal diseases affect almost all Americans. Are the technologies used to promote dental health effective? What are the costs and implications of different preventive technologies?
- Smoking habits and implications of reduced smoking: a case study in integrated policymaking. How effective are the strategies used to reduce smoking? How can the impacts of reduced smoking on the tobacco industry be mitigated? Can an integrated Federal policy for tobacco and its use be designed?
- Federal roles in health promotion and disease prevention technologies. What are current Federal activities that further or limit these technologies? What are potential activities? What are the broad implications of alternative activities?

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Priorities (Continued)

TECHNOLOGY AND WORLD POPULATION

Problem. Modern medical and public health technologies have greatly improved the quality of human life. However, a significant side effect is the growth in human numbers that has resulted from the reduction in mortality and increased life expectancy. A global population that by the time of Christ had reached approximately 250 million and that took 16 more centuries to double, has now reached 4 billion with the prospect of doubling again in 40 years. A growth rate of this magnitude has major adverse implications for the global biosphere and for international economic and political stability. For the less developed countries with the highest growth rates, the problems posed by rapid population increase are particularly acute. Their economic development goals are jeopardized by the need to divert resources to meet the requirements of an expanding population and the increasing proportion of net consumers in the society (particularly the very young and the unemployed).

OTA Role. The proposed study would assess the implications of rapid population growth. Potential topics for inclusion are as follows:

- Basic demographic data. Has the rate of global population growth begun to slacken? If so, why? Can this trend be expected to continue? How can the successful programs best be replicated in other countries?
- Contraceptive technology. From a biomedical standpoint, what are the comparative advantages and drawbacks of various contraceptive technologies in terms of safety and effectiveness? What are the prospects for a significant improvement in contraceptive technologies?
- Fertility determinants. Is high fertility more a function of socioeconomic factors (e.g., the status of women) or ignorance of and lack of access to contraceptive technologies?
- Impacts of population growth upon health care, economic development, and environmental quality. What is the nature of these relationships and the gaps in present knowledge concerning them?
- Population, technology, and international conflict. Can rapid population growth interact with technological innovation under some circumstances to produce international aggression and sizable migration pressures?
- Population policy. Can government policy most effectively influence fertility through socioeconomic development or through provision of contraceptive services? Is there an optimal combination of those two approaches?
- Institutions. What is the best institutional arrangement within the U.S. Government for formulating and administering an overseas population program?

Priorities (Continued)

IMPACT OF TECHNOLOGY ON PRODUCTIVITY OF THE LAND

Problem. There is increasing reason to believe that the primary productivity of American lands—croplands, wetlands, grasslands, and forests—are undergoing or are facing serious deterioration. Unless current productivity trends are reversed, it is estimated that the United States will be unable to meet its own agricultural needs through the next century. Further, environmental deterioration of the land will constrain U.S. efforts in assisting developing countries provide for their fast-growing populations' basic human needs. The combined adverse effects of misapplied and noncoordinated technologies have led to the present conditions of our land. Farmers, bowing to economic pressures for immediate maximum yields, commonly have resorted to strategies and procedures inappropriate to long-term sustenance of the land. In addition, the demands of a highly technological urban society have forced the wholesale conversion of productive lands to airports, highways, strip mines, and areas of general urban sprawl. Decision makers must understand the limits to the land's carrying capacity.

The social and economic benefits accruing from technological interventions in the areas of agriculture and land use are numerous. However, these gains may be reversed due to impact of inappropriate, short-term agricultural practices and the indiscriminate alteration of the land's physical and biological systems. The debilitating effects of chemical fertilizer and of erosion upon the soil, the threats posed to water quality by pollutants and by ill-conceived irrigation projects which lead to increased salinity, the depletion of ground-water resources, and the conversion of prime farmland and wetlands all are examples of the inadvertent destructive effects of common technologies.

OTA Role. What misapplied and noncoordinated technologies have wrought, properly considered technological and land use practices may repair. The development of integrated strategies by Federal, State, and local governments, and the private sector are required to halt deterioration of our land's productivity. The project will:

- assess the beneficial and adverse impacts of relevant current technologies on sustained land productivity,
- examine the quality of the present data base for forecasting rates of change in land productivity,
- present selected case studies showing how society is affected as ecological systems of the land break down,
- determine gaps in our knowledge base,
- inventory and assess new technologies to provide for sustainable land productivity, and
- outline strategies for fostering sustainable land productivity in the United States.

Priorities (Continued)

IMPACTS OF TECHNOLOGY ON PRODUCTIVITY, INFLATION, AND EMPLOYMENT

Problem. Inflation, lagging productivity, and unemployment are three of the most critical socioeconomic problems facing the United States today. Each of these problems has roots in technology as well as consequences for technology.

For example: although the mass-production of automobiles made it possible to improve labor productivity, it also displaced labor as other modes of transportation were used less. Further, the mass-produced automobile gave rise to increased reliance on petroleum-based fuels and, eventually, on foreign sources of petroleum. The recent price hikes in crude oil from abroad have been a significant factor in our current inflation. Some observers suggest that an inflation-weary workforce, whose paychecks buy less even when they rise, may itself be at least one factor in our sluggish productivity gains. And dollars that buy fewer goods and services also buy less research and capital equipment for technological development.

The interrelationships between technology and our economic system, including the problems of inflation, lagging productivity, and unemployment, are complex, critical, and little understood. As a result, technology policy is made with little knowledge of its economic impacts, and economic policy is made with little understanding or consideration of its impacts on technology. A better understanding of the links between technology and the economy is essential to the design of public policies to improve the impacts of technology on our economy.

OTA Role. An OTA study would explore the complex interrelationships between technology and the economy—with particular emphasis on the impacts of technology on productivity, inflation, and employment.

Because so little information exists concerning the techno-economic system—the set of connections between technology and the economy—the first task of an OTA study would be to develop a practical model of that system which shows the cause-and-effect connections between technology and the economy. The study would then examine the various policy mechanisms that might be employed to improve the impacts of technology on the economy.

The study would address such issues as:

- Does the operation of the techno-economic system vary with different tax climates and different patent policies?
- What effects does the investment of different amounts of manpower and resources in R&D have on the economy?
- Do diverse sectors of the economy (steel, chemicals, services) employ their technologies differently? If so, could case studies of specific industries suggest ways of improving employment or productivity in different sectors of the economy?
- How does the decisionmaker or planner “get at” those parts of the techno-economic system that serve as leverage points for policy changes or improvements?
- Can technology be employed to improve productivity in the growing service sector?

Priorities (Continued)

TECHNOLOGY AND THE DEVELOPING WORLD– MEETING BASIC HUMAN NEEDS

Problem. As many as 1 billion inhabitants of the developing countries live in abject poverty, their most fundamental needs–food, shelter, health, clothing—unmet. Traditional foreign assistance strategies employed in these countries have measured progress by aggregate growth, as reflected in gross national product (GNP). However, it has become clear that, despite the efforts of these programs and the rise in GNP in many developing countries, the economic plight of vast numbers of people has remained unaffected, or even worsened. The "basic human needs" (BHN) approach is an alternative development strategy that concentrates resources on the attainment of a minimal standard of living essential to life and dignity. The purpose of this study would be to assess the ways in which technology can contribute to and implement a BHN strategy.

A vast range of existing technologies—from the highly sophisticated to the "intermediate" or "village Ievel''—can help meet the basic human needs of the poor, In the fields of agriculture and rural development, health, education, shelter and clothing, energy, and population growth, processes as diverse as, for instance, satellite telecommunication and the construction of simple sand filters for water purification, are all relevant to the implementation of a BHN strategy. As yet, however, there is no inventory of such technologies that both covers the entire range of human needs—food, water, shelter, clothing, health care, education, employment opportunities, and basic services—and considers the spectrum of levels of technology appropriate to the provision of those needs. The development of effective and internally consistent aid packages, attractive to and answering the needs of individual countries, requires such an inventory.

OTA Role. The proposed study would develop a comprehensive inventory of technologies for implementing an effective BHN strategy which respects the goals, leadership initiative, and self-reliance of the developing countries involved. The inventory would include both existing and prospective technologies and identify areas where R&D seems to be required. Criteria for selecting and evaluating technologies (factor costs, environmental and social impacts, the local resource base, the availability of markets, etc.) would be identified and analyzed. Questions regarding methods for melding highly sophisticated and very simple technologies would be addressed. The compatibility between various technological approaches and U.S. foreign policy objectives would be considered.

Priorities (Continued)

PEACE TECHNOLOGY

Problem. An OTA study would examine a range of technologies that might be used to monitor compliance with international agreements. These technologies, by making the undetected evasion of agreements less feasible, and/or by permitting dissemination to a worldwide audience of evidence of compliance, would expand the range of workable and attainable arms control measures, and would perhaps permit new types of stabilizing international agreements. The study would review the feasibility of different approaches, determine the most appropriate national and international institutions for utilizing the equipment, assess the kinds of agreements which might be made possible through the use of such equipment, and review priorities for supporting research in the area. The strategies with which this equipment would be used would be carefully examined. The devices may, for example, reduce the need to demand "onsite" inspections of certain classes of arms limitation agreements, and arrangements might be negotiated calling for onsite proof of irregularities detected by the equipment. Techniques for escaping detection of the equipment would be carefully examined.

OTA Role. Four major categories of technologies would be examined.

- International Verification Equipment. The study would evaluate prospects for developing equipment that could be used by an international organization to monitor compliance with bilateral and multilateral arms control agreements. The concept of an international verification satellite would be one example.
- "Black Boxes. " The study would examine the feasibility of developing tamper-proof seismic, photographic, and other sensing equipment which could be placed on territory subject to an arms control agreement.
- Unmanned observatories for monitoring borders and troop movements. Such equipment could be used to monitor agreements limiting troop movements, maneuvers, and force sizes. They could also be used to monitor disputed borders and demilitarized zones without moving military personnel into sensitive areas.
- Nonproliferation Safeguards Technology. Technological innovations and devices can help reduce the likelihood of a spread of nuclear weapons by limiting access to materials and technologies which could be used to produce nuclear weapons. These technologies include new reactor designs (the "nonproliferative reactor"), alternate fuel cycles (thorium), modifications to present fuel cycles, and safeguards technology. The latter includes advanced nuclear material accounting systems, onsite containment and surveillance equipment, tamper-proof seals, external monitoring devices (atmospheric sniffers and satellite observation).

Priorities (Continued)

IMPACT OF MICROPROCESSING ON SOCIETY

Problem. The advent of microprocessing technology–the so-called "computer on a chip' '—has been heralded as an event comparable to the invention of the printing press. This technology not only fundamentally alters man's ability to organize and use information, but is making it possible to reliably and inexpensively incorporate "intelligent" functions in a growing number of products and devices used by man.

Yesterday's trip to the moon depended on microprocessors; tomorrow's kitchen ranges and washing machines will be controlled by them. Potential applications for the microprocessor abound. While it is revolutionizing the computer industry, the microprocessor is central to the marriage of the communications and computer technologies, the root source of our transformation to an information society. Few aspects of man's activities will escape the influence of this robust new species of technology.

OTA Role. The pervasive use of microprocessors will have significant and enduring consequences for the individual and for society. Some will be beneficial; others may be adverse. The proposed study would assess the potential impacts of the microprocessing revolution on society and the policy alternatives for coping with that revolution. The study would address such interrelated issues as the implications of microprocessor technology for individual rights, employment, and labor, international trade, and the functioning of government and business. The potential contribution of this technology to the communications and information industries, health and education, and banking and payments systems would also be assessed. This study would result in:

- A survey and forecast of microprocessing technology.
- Identification of likely services and applications.
- Examination of the social and economic issues.
- Examination of the policy and regulatory issues.
- Formulation of policy alternatives.
- Assessment of the consequences of implementing each policy alternative.

In addition to the consideration of effects outside the information and telecommunications sectors, this assessment would complement the ongoing OTA studies of National Information Systems and the Impacts of Telecommunications Technologies by specifically focusing on microprocessing technology.

Priorities (Continued)

APPLICATIONS OF TECHNOLOGY IN SPACE

Problem. Decisions made over the next several years will set the course of activities in the U.S. space program for decades to come. In the two decades since the Nation placed its first satellite in orbit, the space program has been the subject of vigorous debate concerning its goal and implementation, The decision to pursue project Apollo focused policy attention and the Nation's resources on the specific goal of manned lunar exploration. But the effort to achieve this goal deferred development of a comprehensive national space policy for nearly two decades.

With the successful use of near-earth-orbital space, the proposed uses of space are expanding rapidly—beginning with the development of increasingly large and sophisticated space stations, moving to space industrialization, and perhaps to space habitation. Space colonization, once a field of visionaries and science fiction writers, now attracts scientists, who advocate the mining of the moon and asteroids for raw materials.

The promise of space industrialization, however, is clouded by economic, political, and social uncertainties and by equally perplexing questions about the capabilities of technology to perform the tasks required. The space budget will not be large enough to meet all the demands placed on it and choices will have to be made. Space activities thus are both glamorous and uncertain, and objective analysis is needed.

OTA Role. An OTA study would address such issues as:

- What should be the relative priorities of manned and unmanned missions? Is there a future potential for manned lunar, asteroidal, and planetary exploration and exploitation?
- Space-based manufacturing and/or energy production in space require large-scale technologies, such as large orbiting spacecraft and manned space operations. Will benefits of such activities be great enough to justify the major investments required?
- The United States currently has four, largely separate, space programs: military, intelligence, civilian government, and civilian nongovernmental. What are the optimal relationships among them?
- What balance can be struck between developing a space-based military capability and seeking arms control agreements to prevent the militarization of space?
- Other nations are undertaking major space programs with scientific, commercial, and military objectives. As-a result of these additional entries into space, what new international agreements might be required?

This listing of issues is intended to suggest the great variety of factors involved in future space policy decisions. It is far from exhaustive, but only suggests the complexity of public policy issues related to space activities.

Priorities (Continued)

DESIGNING FOR CONSERVATION OF MATERIALS

Problem. In the past, resource demands have paralleled population growth, but new studies indicate that future resource needs will be more closely related to rates of urbanization and growth of the middle class. Both rates are at least double the rate of population growth. Thus, it is expected that in the future, escalating demands will be made upon the Earth's resources to satisfy a growing, urban, middle class. Designing for conservation can relieve this expected growth in materials and energy demand.

There are many approaches to materials conservation. These have been identified in an earlier OTA assessment, and three strategies stand out:

- Products would be designed so that they could be rebuilt or remanufactured.
- Use of renewable resources or more abundant resources could be encouraged in the design and construction of commercial buildings.
- Fewer products might be used, or products might be designed for multiple uses in transportation, residences, and institutions.

Materials conservation is not now a policy of the U.S. Government. There are those who claim that government policies, in fact, promote waste. Thus, the central issue is "to conserve or not to conserve. " Conservation would be a cost borne currently by society to gain future benefits. Critics argue that revamping material usage or changing lifestyles is a tremendous task to undertake for an uncertain future benefit. They claim that the current market system will function adequately to employ new technologies or lower cost substitutes—that conservation, in other words, will take place without governmental interference. Others argue that this is not so; selection of a material for action is the result of a short-term decision process with little or no consideration of long-term consequences.

OTA Role. An OTA assessment of materials conservation would focus on the following questions:

- Will materials conservation have a sufficiently positive impact on national growth and prosperity to warrant consideration as a national goal?
- If conservation is to be a national goal, should it apply to all materials or should it be applied on a case-by-case basis according to the criticality or cost of the material?
- If conservation is to be a national goal, what are the best methods of achieving it? Information? R&D? Regulation? Investments?
- For each implementation approach, what are the current costs? What are the materials savings? What are the future derived benefits?

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FUTURE OF MILITARY EQUIPMENT

Problem. There is need for a broad survey of the kinds of new military technology likely to be developed during the next two decades and for a systematic review of their potential impact on international stability, as well as on the security of the United States and its allies. It is hoped that such a survey could give early warning about technologies now in early stages of research. The project would not examine items receiving or likely to receive major funding during the next 5 years.

OTA Role. Suggestions for systems to be reviewed by OTA would be solicited from the Department of Defense and other organizations concerned about future military equipment. The review of each technology would attempt to answer the following kinds of questions:

- What defensive measures could be taken against it; would the weapon stimulate a major arms race?
- Would it increase or decrease the likelihood that civilians would be injured by a conflict?
- Would it increase or decrease the stability of the current "deterrent" relationship?
- Would it increase or decrease the amount of warning received before an attack?
- Would it increase or decrease the credibility of war with modern weapons?
- Would the weapon advantage an aggressor or a defender? Given geographic and other asymmetries, would it advantage the Western alliance or its adversaries?
- What reaction from our allies is likely, what are the prospects for transferring the technology, is the technology likely to proliferate outside the alliance?
- What are the manpower and budgetary implications?

Priorities (Continued)

IMPACT OF TECHNOLOGY ON THE MOVEMENT OF GOODS

Problem. The movement of goods by highway, rail, air, water, and pipeline is a major element in the U.S. economy. In 1976, over 8 percent of the ‘GNP resulted from the movement of goods. Distribution costs consume more than 13 percent of the sales dollar for manufacturing industries. National policy concerning the current goods movement system is in a state of significant transition, as is the development and use of technologies in that system. It is anticipated that Congress will be considering several substantial changes to current rail and truck regulation. The administration is expected to submit legislation in both of these areas.

OTA Role. An OTA study would explore the two-way interaction between technology and Federal policy in goods movement. It would assess the degree and manner in which Federal policy, especially regulatory policy, can be expected to inhibit or promote the development and utilization of technology. It would also be concerned with the ways in which technology might change the future structure of the goods movement industries and their operations and investments, and thus change the regulatory framework which will be appropriate for such a structure. The study would address the following major issues:

- Reducing Unnecessary Goods Movement
- Intermodal Transfer
- Transport Information and Control Technologies
- Railroad Electrification
- Transportation Rights of Way
  —Railroad rehabilitation
  —Truck size and dimension limits
- Urban Goods Movement
- The Impact of Regulation on Technology and the Impact of Technology on Appropriate Regulatory Structures.

WEATHER AND CLIMATE TECHNOLOGY

Problem. In the winter of 1976-77, half the United States found itself suffering under record low temperatures while the other half waited for rainfall to end a severe drought. This destructive combination was the consequence of a temporary change in normal world weather patterns. Some experts believe that within decades we will be able to accurately predict these changes, possibly a year in advance. The implications of such a capability would be considerable. Consider, for example, the impact on agriculture if farmers knew what weather they would face a year in advance of planting a crop.

At the present time there is no consensus on any single forecasting technique. There is general agreement, though, that the global climate machine is extremely complex and that the most crucial piece of the puzzle is the interaction between the atmosphere and the ocean. Researchers are presently experimenting with a variety of forecasting tools.

The better known include:

- Quantitative computer models that simulate the atmosphere and which some day may be used to predict global weather.
- Three-month forecasts based on links between surface temperatures in the Pacific and changes in weather over North America.
- Analysis of long-term climate changes over the past several thousand years. Study tools include tree rings, sea bed sediment, and polar ice samples. Technologies range from satellite monitoring to carbon dating.

OTA Role. An OTA study would:

- Analyze the long-term implications of weather trends for food, energy use, demographics, transportation, and foreign policy.
- Explore ways of reducing man's adverse impact on global weather and climate.
- Review assessments of Federal R&D and data collection in this area.
- Assess present and prospective weather prediction technologies.
- Assess present and prospective weather modification technologies and the potential economic, social, and diplomatic implications of various levels of weather modification capability.

ALLOCATING THE ELECTROMAGNETIC SPECTRUM GLOBALLY

Problem. In September of 1979, delegates from the 154 member nations of the International Telecommunications Union (ITU)—the UN agency concerned with the international use of the radiofrequency spectrum—will attend the World Administrative Radio Conference (WARC) to review and revise the International Radio Regulations which govern the use of the spectrum throughout the world. This Conference, the first in 20 years with the power to consider all uses of the spectrum, will set the basic framework for world use of the spectrum for the rest of this century. Its results will guide the development of national and international telecommunications systems into the next century.

The radiofrequency spectrum is a critical and limited resource whose use must be coordinated on the global, regional, national, and local levels in order to accommodate the many conflicting demands upon the spectrum and to prevent systems from interfering with each other.

At WARC 79, the developing nations will, for the first time, have an organized majority of the votes in deciding how the uses of the spectrum are allocated among nations. Third-World nations seek a "New World Information Order" which would redress the current imbalance in the control of information technology, systems, and resources between the developed and the developing nations.

Under current rules, frequency assignments are made largely on a first-come, first-served basis, which gives priority to the established and most technically advanced users of the spectrum. The developed nations generally favor this approach. The developing nations, on the other hand, favor a "fixed allotment" or "equal access" approach which apportions "rights" or "shares" to the spectrum among all nations whether or not they are, or will be, technically able to use their share. Through bloc voting in the ITU, the developing nations have recently secured the adoption of "fixed allotment" plans for a few bands of the spectrum. They will probably seek to extend that approach to the allocation of additional bands of the specturm at the 1979 WARC.

OTA Role. An OTA study would explore the long-term implications and impacts of the likely outcomes of WARC 79. The different allocation strategies that may emerge from WARC 79 will affect the development of future technologies and systems in different ways and have varying economic, political, and social consequences.

IMPLICATIONS OF INCREASED LONGEVITY

Problem. The number of older Americans is growing. In the last 25 years, the proportion of the total population 65 or older grew from less than 7 percent to more than 10 percent. Current population projections indicate that by the year 2030 almost 20 percent of our population will be elderly.

Technological breakthroughs in the next 30 years could significantly increase American life expectancy through disease control. In addition, the development of alternative technologies to control aging processes could extend lifespan itself. Because these technologies will primarily affect mortality rates among the middle-aged and the old, the proportion of the elderly to the total population could rise even more dramatically than anticipated.

Changing the size and age composition of the U.S. labor force will have a substantial impact on the general economy. The ratio of active workers to retired citizens is predicted to be only 3 to 1 by the year 2030. On the other hand, the proportion of dependent children in the population will also decline. The current trends indicate that during the next 100 years the dependency ratio—the number of people under 20 and over 64 divided by the number from 20 to 64—will never be as high as it is today.

The elderly now constitute 10 percent of the population, but 25 percent of the poor. Increasing numbers of the elderly will strain social service systems and could lead to their eventual breakdown.

OTA Role. The proposed assessment would examine the following issues:

- Technology prospects: The range of innovations in medical technology that promise to increase human life.
- Technology development, use, and distribution, including national policies on priorities for funding research among technologies that could affect life expectancy; mechanisms for screening technologies to identify and eliminate those which might have significant negative consequences; and means of distributing new technologies equitably among the population.
- Economic implications of an aging society: retirement policies and their consequences; alternatives for more flexible career patterns; the adequacy of existing private and public pension funds for meeting the financial needs of the elderly and possible alternative mechanisms for providing income maintenance.
- Implications of increased longevity for the health care system, housing, transportation needs, and social and community services; projected costs for each sector with the special needs of the elderly taken into account; and alternatives to the present organization of services to improve the quality of life for the aged.
- Alternative roles for the elderly in American society: programs designed to improve their abilities and resources, such as special education; the relationship of public policies to the role of the elderly in the family, in the community, and in the political arena.

Priorities (Continued)

CONTROLLED THERMONUCLEAR FUSION

Problem. Currently the United States is spending $500 million per year on research into controlled fusion, with the aim of building a power-producing reactor by 2005. Although the potential of fusion is great, major questions concerning cost, feasibility, and impacts remain. These indicate the need for a thorough assessment of just what the world is buying by this investment in fusion R&D. The purpose of this assessment is to examine the potential of fusion and the implications of a fusion economy.

Controlled fusion is a nuclear reaction by which hydrogen isotopes are joined in a way that permits capture and conversion of the nuclear energy to produce useful power, most probably electricity. The two major paths being pursued are magnetic confinement and laser compression. The former, which uses a magnetic field to contain the elements being heated to fusion conditions, is likely to achieve scientific demonstration before the latter, which uses laser power to achieve fusion. Beyond the scientific challenge, there remains the considerable engineering task of building a power reactor using either method and of solving the many potential environmental and safety problems. The current best guess is that a commercial power reactor using magnetic confinement can be built by 2005 to 2010.

OTA Role. An OTA study would examine such major issues as the following:

- Fusion appears to be less hazardous than present nuclear fission technologies, but formidable environmental and safety problems exist and will require careful, continued review.
- Successful attainment of fusion could provide the world with an unlimited source of energy. That achievement would be without precedent and would present society with a set of benefits and possible problems for which we are unprepared. The utility of fusion energy, of course, would be dependent upon the full cost of the process to be developed.
- Manmade fusion would be a centralized very high-technology energy source that could raise a number of problems about control of the energy economy and compatibility with the dispersed technologies based on solar energy, the natural fusion energy.

TECHNOLOGY AND MENTAL HEALTH

Problem. Mental health and mental disorders now constitute a major health issue in the United States. Mental health care is needed by 10 to 15 percent of the population; yet only 2% percent receive such care annually. Still, mental health care costs $17 billion per year. This cost represents almost 15 percent of the total cost of health care and more than l percent of the gross national product.

Physical, psychosocial, and social mental health technologies meet many health care needs, thereby improving the quality of life for many Americans. Demands for such technologies will increase in the future for two main reasons: an increase in elderly persons who have prolonged chronic health conditions likely to be accompanied by emotional stress, and an increasing acceptance by the general public of mental health technologies.

Federal, State, and local government responsibility for the provision of mental health services has grown since the early part of this century, particularly with the passage of Medicare and Medicaid. If national health insurance is enacted and if the recommendations of the President's Commission on Mental Health are implemented, the Federal role in mental health care will increase substantially.

Such an expansion necessitates a comprehensive assessment of the efficacy, safety, and cost-effectiveness of technologies designed both to promote mental health and treat mental disorders. The increase in use of mental health technologies by persons who do not perceive themselves as mentally ill should be assessed. Policy decisions also need to be made concerning the use of and reimbursement for mental health technologies used as preventive services.

OTA Role. The proposed study would assess the efficacy and safety of mental health care technologies as well as the social, legal, and ethical questions raised by their use. Examples of such issues include:

- Protection of consumers from ineffective and/or harmful technologies.
- Definition of the boundaries between mental, physical, and environmental health, education, and welfare and other social services.
- Protection of privacy with respect to seeking or refusing treatment, and with respect to data collection and use.
- Access to services for all who want or need them.
- Delineation of the diversity of service that can be publicly supported.
- The potential of mental health care as an alternative to drug abuse, alcoholism, and violence.

TECHNOLOGY AND EDUCATION

Problem. At least since World War II, a perpetual hope and a recurrent disappointment has been the idea that technology can enhance preschool elementary, secondary, and higher education. Technology-assisted education is also seen as a means of outreach to populations at large to meet knowledge needs and to enhance the quality of life. A review of what is known about the successes and failures in this area and an assessment of future opportunities for the employment of technology are particularly timely. The lessons of experience should be brought to bear on the new opportunities presented by cable, microwave, communications satellites, information packeting, video tapes, discs, and many other new developments.

Education, using such technologies, may move from a parochial, local level to a national, continental, and global level. The potential U.S. role as a unilateral, bilateral, and international participant in these new technological possibilities should be assessed.

Technology will affect not only the medium of education, but also the message. Science and technology as a major cultural subject, rivaling history and English in importance, is basic to a healthy democracy.

OTA Role. An OTA assessment would examine a number of broad topics concerning the relationship between technology and education. These include the following:

- Technology as a means of improving the quality and availability of education in the formal and informal education systems.
- The implications of gIobal educational technology for U.S. educational and foreign policy.
- The cost-benefit calculus for technological innovation in education.
- The role of institutional factors in the successful introduction of new educational technologies.
- The effect of new technologies of education on students' ability to acquire basic skills (e.g., reading) and personality traits (e.g., persistence).

PRESCRIPTION DRUG USE

Problem. The use of prescription drugs in the United States has increased approximately 400 percent since 1950. About 10 percent of the Nation's health care dollar is currently spent on drugs. Americans purchase more than 2 billion prescriptions every year at an estimated cost of $10 to $13 billion. On the average, each outpatient physician visit generates 1.6 dispensed prescriptions. The elderly acquire nearly three times as many outpatient prescriptions as do younger individuals.

Used judiciously, many prescription drugs provide cost-effective treatment that helps people overcome or tolerate their medical problems. Unfortunately, as much as 25 percent of prescription drug use may be ineffective, unnecessary, or even harmful. Adverse drug reactions, many of which are predictable, may kill as "few" as 24,000 or as many as 130,000 people annually.

Several factors influence the use of prescription drugs, including promotion by the pharmaceutical industry, prescribing habits of physicians, and public demand for drugs. These three factors and others may influence drug use more than objective analysis of a drug's particular ability to correct or ameliorate a medical problem.

Most drug use in hospitals is paid for through public and private health insurance. Conversely, most outpatient drug use is paid for solely by the individual. In 1974, Americans purchased about 1.7 billion outpatient prescriptions at an estimated cost of $8 billion. According to a 1973 survey by the National Center for Health Statistics, about 75 percent of these prescriptions were paid for solely by consumers. In 1973, private health insurance companies spent an estimated $528 million for outpatient drug use. In 1974, Federal and State governments spent about $753 million for the same purpose.

OTA Role. Each year, Congress is asked to allocate more Federal funds to expand health care benefits, including the use of outpatient prescription drugs. In order to help Congress assess the potential implications of expanding drug coverage under publicly financed health insurance, the proposed OTA analysis would address the following items:

- An analysis of current prescription drug use.
- An assessment of benefits and costs associated with this drug use.
- An assessment of mechanisms available to help ensure appropriate drug use.
- An assessment of means of reducing the need and demand for drugs.
- An analysis of potential effects of publicly financed drug insurance.

Specific issues include selection of drug products, selection of health insurance beneficiaries, new applications of technology to finance and administer a drug benefit program, and the development of drug use monitoring systems.

Priorities (Continued)

FOREST RESOURCE TECHNOLOGIES

Problem. Forests are dynamic systems that help support the life-sustaining capacity of the global environment. They are living factories supplying renewable sources of energy and materials, generating food and oxygen through photosynthesis and ensuring continued productivity of land and water by filtering degradable wastes, storing CO_2, regulating water flow, and protecting against erosion and flooding. Although outwardly impressive and apparently enduring, forests are in fact frail ecosystems. It takes from **20** to 100 years for a tree to grow to maturity. Policy decisions made today will affect the availability of forest resources in the 21st century.

Forests cover nearly one-third of the Earth's land area, yet trends in forest exploitation have resulted in a reduction of global forest area of 15 percent since 1963. The global demand for wood and forest products is estimated to be increasing at a yearly rate of 3 percent. Expected increases in population and economic growth suggest a large increase in the demand for forest products. In the developing countries, **90** percent of wood consumption is for fuelwood. Existing forested areas are rapidly being depleted through overcutting, overgrazing, and clearing for crop and pasture lands, Failure to reforest depleted areas has led to erosion, flooding, siltation, and in some cases, desertification of once fertile land.

The United States is blessed with abundant forest resources; one-third of the land area is forested. Commercial forests, those capable of producing harvestable volumes of wood, compose 66 percent of U.S. forest lands. Fifty-nine percent of commercial forest lands are held by private, nonindustrial owners, 13 percent by the forest industry, 22 percent by the Federal Government, and the remaining 6 percent by State and local governments.

OTA Role. A study of the future of forests and forest resources would examine the increasing pressures on the forests of the world from population growth and economic development, assess the interaction of the elements of forest growth and harvesting and wood processing and uses, and analyze the impacts of technology on all parts of the system, It would concentrate on three principal issue areas:

- Forest management technologies and methods in the United States: Current trends and alternative future policies for domestic forest resources.
- Current international trends in supply and demand for wood: Implications for world forest resources and the global environment.
- Present and potential uses of renewable forest products for materials of construction, chemical feedstocks, and energy including technological innovations which will influence those uses.

Priorities (Continued)

HEALTH TECHNOLOGIES AND THIRD-WORLD DISEASES

Problem. The developing countries contain more than half the world's people, and more than one quarter of those people live in absolute poverty. Lacking a decent diet and clean water, they are, in overwhelming numbers, easy prey to a whole host of infectious diseases. Infant mortality rates are extremely high; the health status of adults is poor. The rapid population growth in the Third World exacerbates the problems of malnutrition, unsanitary environments, mortality, and morbidity.

People are one of the Third World's most basic and abundant resources. To improve the health of those people is to help build the base for successful and sustainable economic development and eventual population control in that World.

Many of the technologies required to control the impacts and incidence of a wide range of Third-World diseases and disorders already exist. For example, the greatest need in most developing countries is for simple primary and preventive health care, proper nutrition, and environmental sanitation. There are, in addition, a variety of technologies for treating and preventing such widespread Third-World diseases as tuberculosis, neonatal tetanus, measles, and Yaws. Yet, Third-World countries are currently unable to realize the potential benefits of a whole array of technologies including many pharmaceuticals and chemotherapies which, according to the World Health Organization (WHO), are "too cumbersome, too crude, and too costly for effective widespread use." WHO stresses the need for the development of more effective, nontoxic chemotherapies that can be supplied at a lower cost.

OTA Role. The proposed OTA assessment of Third-World diseases would examine three major areas: (1) research and development in health technologies; (2) the application of those technologies; and (3) the delivery of those technologies. Major issues in each of those areas include:

Research and development:

- an inventory of the most common Third-World diseases and available technologies for dealing with them;
- the adequacy of U.S. resources, public and private, now devoted to research into Third-World diseases;
- the value and need for expanding research and development efforts and the specific directions such research might take.

The application of health technologies:

- the present and potential applications of health technologies;
- missed opportunities to eradicate and/or mitigate the adverse effects of common Third-World diseases;
- the effects of fragmented responsibility in international health assistance, including research and development and technological transfer and applications.

The delivery of health technologies:

- the relative appropriateness of investing in capital-intensive medical care and sophisticated physician services located in urban centers or in primary and preventive health care centers using regional and community level workers;
- the possible roles the United States might play in helping developing countries build suitable health care infrastructures.

Priorities (Continued)

ELECTRIC VEHICLES: APPLICATIONS AND IMPACTS

Problem. Recent concern for petroleum conservation and clean air has led to a renewed interest in the electric vehicle (EV) for personal and commercial transportation. The EV can use nonpetroleum fuel and emits virtually no local pollutants. However, the present-day EV does not compare favorably with the petroleum-powered automobile on a cost or performance basis. Considerable research is being directed at improving the characteristics of the electric vehicle. Travel surveys indicate that much of the Nation's daily transportation needs could be met by electric vehicles, although market projections do not indicate high usage rates of EVs even by **2000.** Difficult technical, economic, and institutional problems must be overcome for large-scale EV commercialization to be successful, and the impacts of widespread application have not been comprehensively examined.

In 1976, the Congress enacted—over an executive veto—a law requiring that **7,500** to 10,000 EVs be put into operation by the mid-1980's for demonstration purposes. Various pieces of legislation designed to encourage the development and use of EVs have since been introduced.

OTA Role. The proposed study would explore and assess the potential impacts of an increasingly widespread use of EVs over the next 40 years. The study would assume that, by the year 2020, EVs would displace some 50 to 75 percent of petroleum-powered vehicles for both passenger and commercial use. Different "transition scenarios" likely to lead to that high level of displacement would be developed. The energy, environmental, economic, social, and institutional impacts of these different transition scenarios, and of the widespread use of EVs by 2020, would be determined and described.

Priorities (Continued)

R&D PRIORITIES FOR U.S. FOOD PRODUCTION

Problem. The agriculture industry is by far the largest in the United States. Agricultural products are one of the largest items in U.S. exports and, in times of crop failure elsewhere in the world, the ability of the United States to produce more food than we need has meant the difference between starvation and survival for millions of people. U.S. agriculture is also one of the great success stories of American technology—as is, in large part, the Green Revolution, which has spurred such enormous advances in food production in some areas of the developing world. Yet rising fertilizer and fuel costs have largely brought the Green Revolution to a standstill and the increase in yield-per-acre of American agriculture has, in recent years, begun to flatten out.

The basic question is whether and how the productivity of American agriculture—whose products and whose technology are already so critical to world food supply—can continue to grow at adequate rates over the long term in the face of a large and increasing array of constraints and costs. Some scientists, for example, question whether the soil can remain productive with ever-increasing yields removing larger and larger amounts of soil nutrients, and with the application of increasing amounts of pesticides and fertilizers which may ultimately cause drastic adverse effects on soil microorganisms and the productivity of the soil itself. The loss of prime farmland to urbanization and other uses; the growing shortages of water in some agricultural areas of the country; the rising cost and relative scarcity of fuels to support high-energy agriculture; the need for U.S. agricultural exports to help offset rising costs for imported fuel and materials as the export of U.S. manufactured goods continues to decline; the prospect of increased reliance on the United States to meet rapidly growing food demand around the world—these are a few of the factors that combine to underscore the need for ensuring the long-term productivity of American agriculture.

OTA Role. An OTA study would assess R&D priorities for U.S. agriculture in terms of the growing constraints upon productivity and the technological possibilities for easing these constraints and ensuring long-term productivity. The study would evaluate such technological “functions” as soil fertility and management, energy, breeding, water resource management, and harvesting in the various commodity sectors in relation to their present and future importance to U.S. food production, their present constraints, their interrelationships, their research requirements and the likely success of such research.

Priorities (Continued)

ALTERNATIVE MATERIALS TECHNOLOGIES

Problem. Increasingly, at many points along the materials cycle, the present system of supply, use, and disposal of materials must be balanced against other important public concerns, such as occupational health and safety, energy conservation, environmental quality, industrial innovation, and inflation.

Nevertheless, the production and exchange of material products remain central to the U.S. industrial economy. There is concern in some quarters about the availability of a continued expanding supply of resources to meet future demands.

These and other concerns reflect three fundamental changes that have occurred in the U.S. and world economies during the last three decades: 1) Resources have become potentially scarce rather than plentiful. 2) The environment is no longer regarded as an infinite sink for wastes, but is recognized instead as our vital life-support system. 3) American technology and industry are no longer preeminent, but are increasingly subject to sharp competition from other countries.

Alternative materials technologies may provide significant opportunities to help resolve these conflicts. Candidate technologies might include: aerial and satellite remote-sensing technology; deep-drilling technology; geostatistical supply modeling and computer mapping technologies; product remanufacturing; and materials substitution.

OTA Role. An OTA study would assess selected alternative materials technologies, and the policies necessary to implement them from the perspective of environment, energy, health and safety, and inflation as well as materials availability and conservation.

Priorities (Continued)

DEEP OCEAN MINERALS DEVELOPMENT

Problem. A quarter of the world's oil production now comes from offshore fields—about double the seabed production of a decade ago. In addition, there is increasing interest in the undersea mining of such hard minerals as manganese nodules.

Undersea petroleum drilling is a rapidly changing field. In 1972, the record water depth for drilling reached 1,200 feet. Now, with the development of advanced platform positioning, special well control systems for deeper water, and other newly designed equipment, the maximum water depth has been extended to almost 3,500 feet.

Because the petroleum industry is operating at increasing ocean depths and in a more hostile environment in its search for gas and oil, the possibility of serious and unanticipated technological problems becomes more likely. Solutions to some of these problems may be transferable to the undersea exploitation of hard minerals such as manganese nodules, which may be a major future resource. The economics of ocean drilling and mining merit study, as do the jurisdictional problems that might arise from operations in international waters. The output of this study should be helpful to ongoing Law of the Sea negotiations.

OTA Role. An OTA study of deep ocean minerals development would contain four major elements:

- Analysis of the current drilling and mining technology, and an identification of future research and engineering requirements.
- Estimation of the total potential recoverable resources from the deep seabed—both regionally and globally.
- Identification of the economic and environmental impacts of deep ocean mining, including special deep-water drilling and mining costs.
- Analysis of the legal and institutional questions associated with ocean mining, including those covering jurisdiction in international waters and existing and proposed treaty obligations.

ENERGY EFFICIENCY IN INDUSTRY

Problem. The transition from oil and gas to direct coal, electricity, and direct solar energy over the next several decades will be accompanied by-an increase in energy costs. This in turn will necessitate substantial efforts by industry to hold down those costs. Options range from massive substitution of labor for energy to installations of entire new technological processes that use the coming energy forms efficiently.

Industry is the largest single sector in the energy problem. It uses close to 40 percent of the Nation's energy supply. Currently, substantial efforts are underway in industry to increase energy efficiency because of rising prices. These efforts, however, concentrate on existing technologies and fuels. Less effort is going into research on new processes that could most economically use the energy sources that some day must replace oil and natural gas. Such research might include substitution of electrochemical for thermochemical processes and development of chemical or physical methods that could effectively use direct solar energy. The alternative to finding new technologies to combat high energy costs will probably be large-scale substitution of labor for energy.

OTA Role. An OTA study would examine the range of options for increasing energy efficiency in industry and their impacts on society and the economy, and identify the policy options for encouraging the efficient use of the new energy sources.

The proposed study would explore such issues as:

- The potential impact of new efficient process technologies on productivity and employment.
- The potential contribution of more efficient energy use to environmental quality.
- The role of Government incentives in stimulating needed technological innovation.
- The problem of capital availability for installation of new technologies.
- The role of oil and gas pricing in stimulating the development of more energy-efficient equipment and processes.

Priorities (Continued)

ROLE OF TECHNOLOGY IN MEETING HOUSING NEEDS

Problem. As a result of the widening gap between family incomes and the cost of housing, substantial segments of the population cannot afford to buy a home. A substantial body of research exists to support the contention that only a major shift toward capital-intensive processes can bring the costs of housing back to levels middle-income families can afford, and that these technological innovations could have other benefits relating to land acquisition patterns, finance costs, and operating and maintenance costs. However, many contend that the regulation of the building industry through antiquated, capricious, and voluminous building codes is discouraging the needed technological innovation that could help control costs.

The traditional role of the Federal Government has been as guarantor of loans and provider of subsidies, leaving the construction of houses to private industry except in the cases of the very poor, the aged, and the military. The support of research within the Department of Housing and Urban Development has largely been targeted away from technology-related research.

OTA Role. The proposed study would focus on those technologies most likely to contribute to improved future performance of the housing industry. These include the creation of new materials and composites; the use of minicomputers in housing design, engineering, and management; new rehabilitation technologies; advanced computational techniques for risk analysis and new design; and increasing knowledge of human responses to housing. Other related issues would include:

- The need to reduce the cost of housing and all of its subsystems: land acquisition, land development, financing, and maintenance.
- The need to reduce overall energy consumption and dependence on fossil fuels.
- The need to remove unnecessary regulations that discourage innovation.
- The need for new training programs to redress the continuing lack of skilled labor.
- Factory-built homes versus onsite construction.

OCEAN WASTE DISPOSAL

Problem. Nobody really knows how waste affects the ocean. Some experts think current volumes of pollution are very dangerous. Other specialists disagree, claiming that the seas are robust and elastic enough to absorb large amounts of discharge. Given proper handling, the ocean may be the most reasonable repository for some types of wastes. But we still need to know which wastes the ocean could accommodate and in what amounts. Also, the least destructive disposal methods should be identified.

Waste reaches the sea in many ways. For example, some cities and private companies barge material out into the Atlantic. Others pump waste to the sea via long outfall pipes. The ocean receives chemical pollution through natural runoff from farmlands. Sewage pumped into waterways finds its way into the ocean. Waste is also generated every time a channel is deepened. Spoil, from dredging operations, is the most voluminous of waste materials and probably the most benign. Industrial waste consists of anything left over after a manufacturing or agricultural process. Federal laws have substantially reduced the deliberate discharge of much of this, but accidents still occur. Municipal waste, probably the most important source of ocean pollution, is a mixture of raw city sewage, treated sewage and residual sludge.

OTA Role. An OTA study of the use and abuse of the oceans through waste disposal would examine such questions as:

- What are the gaps in present knowledge? How and when might those gaps be closed?
- Are we running out of safe disposal sites? OTA would attempt an estimate of total "holding capacity" of both the ocean and land to gauge whether or when we might face a crisis.
- Should any or all methods of ocean waste disposal be eliminated? We would assess the competing technologies and their relative costs.
- What further action should Congress consider? OTA would identify areas that might benefit from further congressional review, analyze technologies most likely to relieve ocean pollution, and identify the risks that accompany the various waste disposal alternatives.

TECHNOLOGY AND THE HANDICAPPED

Problem. Within the last decade, several developments suggest major changes in national policy toward the handicapped and new life-enhancing roles for technology to play in implementing that policy.

Understanding of the origins of handicaps and the scope of the situation is increasing. Improved standards of public health and data collection reveal problems whose scope we were unaware of. According to one estimate, 8 percent of school children are handicapped. Another estimate is that **2.5** percent of the U.S. population are severely disabled. With the steady increase in average lifespan, the impairments of aging will be a growing social concern. Developments in medicine, health, epidemiology, electronics, and materials are creating a new base. of knowledge which should have a major effect in enhancing the quality of the lives of the handicapped by preventing, correcting, relieving, or stopping the worsening of their conditions.

There is an extremely limited private sector market base for developing new technologies for the handicapped, and public institutions have been conspicuously unsuccessful in developing an effective, well-structured program for dealing with this constellation of social needs and major human opportunities. Yet this problem area offers a major opportunity for technology to lift a burden from a large sector of our society.

The handicapped are increasingly active in civil and equal rights movements. Recent legislation, notably Public Law 94-142, is creating wide-sweeping, public obligations for the education of handicapped children. In addition, there are major issues involving transportation, health care delivery, architecture, design, housing—all areas of major governmental action and expenditures. These developments will undoubtedly generate a great demand for preventive, corrective, and rehabilitative social and health care measures. The movement towards bringing the handicapped into the mainstream of public education will ultimately lead to similar “mainstreaming” in occupational sectors. The movement of the handicapped into the work force will also be facilitated by the growth of telecommunications technology and the expansion of information industries.

OTA Role. The proposed project would first determine the present and future scope of the demography of the handicapped, the nature and severity of their limitations, and the scientific and technological potential for preventing, alleviating, or correcting handicapping conditions. The study would then explore and assess the broad impacts on and implications for society of the technologies required to serve the handicapped—including the impacts on the life of the handicapped and the costs and benefits to society.