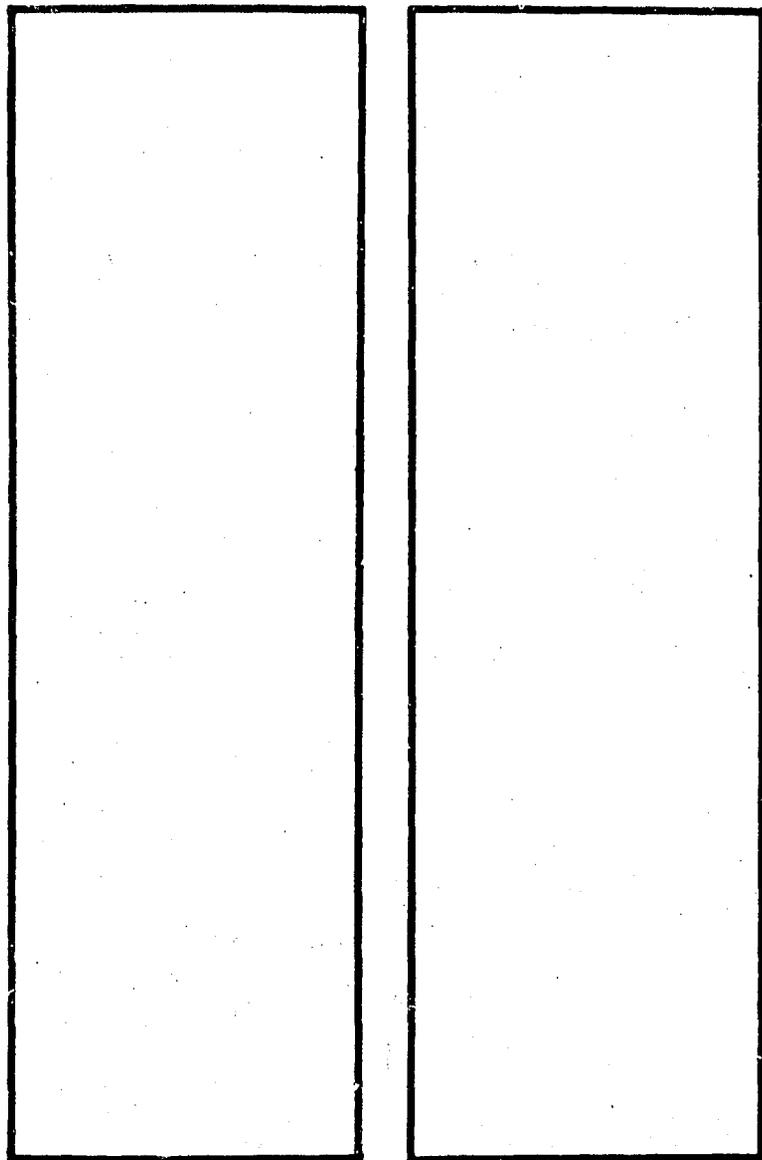


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TA/OST 75-25

INFORMATION ON THE OFFICE OF SCIENCE AND TECHNOLOGY AND ITS PROGRAMS



Office of Science and Technology
Technical Assistance Bureau
Agency for International Development
Washington, D.C. 20523

FEBRUARY 1975

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1. Introduction

The purpose of this report is to compile collected papers of the Office of Science and Technology (OST) in useful form for response to an increasing number of requests for policy and project information from many sources. The report largely supersedes an earlier OST report entitled, Policies and Programs in Selected Areas of Science and Technology, TA/OST 73-18, and may be used to replace the "Science and Technology Services" section of the publication, Directory of Services Provided by A.I.D. Bureau for Technical Assistance, October 1973.

Section 2 presents the entire text of the Agency policy determination providing the main framework and policy guidance for OST activities. The paper was approved by the Administrator, Dr. Hannah, on January 12, 1973.

In October 1974, the policy determination was reviewed by the Administrator's Advisory Council and reaffirmed. A summary of the Council's discussion of this matter was recently forwarded by the Administrator, Mr. Parker, to A.I.D. Mission Directors, representatives and affairs officers. This summary is reproduced in Section 3.

To assist understanding of the scope, level of effort, and orientation of programs within current policy guidelines, OST projects are described briefly in Section 4. A budget summary and listing of completed and nearly completed projects are also included.

The publications prepared in connection with OST projects are identified in Section 5, along with instructions for ordering them from the National Technical Information Service.

Section 6 identifies OST staff members and consultants.

Section 7 contains an address list of universities, private firms and institutions, and Federal agencies involved in implementing OST projects, to facilitate direct contact with these organizations, if desired, concerning project activities.

Many OST projects involve linkages with LDC institutions, frequently within the framework of problem solving networks. These institutions are identified for each project with such linkages in Section 8.

2. Guidance Statement on Selected Aspects of Science and Technology

Introduction

This statement describes an AID program to assist developing countries with selected aspects of the problem of technological transfer and adaptation. It focuses on: (a) helping LDCs develop national policies and institutions which permit developing countries to make better technological choices, particularly in industry; (b) natural resources assessment and management; and (c) reducing public investment costs.

This program is designed as a supplement to AID's priority programs in Agriculture, Population and Health, Education, etc. The statement does not define AID's science and technology strategy in these priority areas. This will be addressed separately, but by focusing on the general problem of improving LDC abilities to make technological choices, this program is relevant to AID efforts in agriculture, population and other priority fields. Moreover, many of the technologies considered have multiple applications in these fields.

Background

Experience has demonstrated that comparatively little U.S. technology can be transferred to LDCs without significant adaptation. The LDCs are aware of the need for technologies which fit their factor endowments and absorptive capacities. Stress is being placed on innovation to develop more appropriate technologies and on devising policies and institutions which permit developing countries to make better technological choices.

The problem of technological choice is growing in significance as unemployment and urbanization increase in the developing countries. Urban populations will increase by about 50 percent in the 1970s. At the start of the decade, they were 54 percent of the population in Latin America, 38 percent in East Asia, 22 percent in Africa, and 14 percent in South Asia. As these shifts proceed, the need for policies and technologies which increase productive employment in the urban industrial and service sectors as well as in the rural sector will grow.

AID's use of U.S. science and technology has generally followed the main lines of its program. Extensive use has been made of American science and technology in agriculture, health, and family planning. Substantial programs of research and development in these areas have been launched by the Agency. Similarly, AID has drawn on U.S. talent in the social sciences and on engineering firms concerned with construction of economic infrastructure. However, relatively limited use has been made of U.S. capabilities in other biological and engineering sciences and in the physical sciences.

It is essential for AID to continue to strengthen the application of science and technology in its major programs.

But it is also important for AID to have a small program focused on the general problem of technological choice--how LDCs can best adapt and utilize foreign technologies and encourage indigenous technological development. AID should also take advantage of selected opportunities for application of U.S. scientific and technological strengths outside its main areas of concentration.

This statement describes an AID program to assist LDCs with selected aspects of technological transfer and adaptation. The selection of activities reflects almost three years of Agency experimentation and analysis, as well as widespread consultations within AID and with many experts and development administrators of the developing countries, U.S. institutions, and other assistance agencies. Experience in these areas is still quite limited, and the focus of efforts will be kept under periodic review and amended as experience suggests.

Concentration Areas

The first emphasis of this science and technology program will be on policy and institutional development--helping LDCs build their capabilities for using science and technology more effectively in support of development. There will also be smaller programs in natural resource assessment and management, and reducing public investment costs. AID will support LDC initiatives where they are strongly supported locally.

(1) Science and Technology Institutional Development: AID will focus on helping the LDCs in three areas:

- Developing institutions for formulating national science and technology policies, priorities, and organizational responsibilities and for implementing decisions in this field.

- Encouraging more effective orientation of LDC university science and engineering programs to development needs.
- Strengthening the capabilities of LDC industrial service institutions to assist local industries in selecting, adapting, and using technologies suited to their circumstances, with special attention to support of small-scale industry.

This program reflects a need for national institutions that are effective in pursuing two related purposes. One purpose is to stimulate the efficient development of scientific and technological capabilities which meet national development requirements. The other purpose is to stimulate more effective use of existing scientific and technological capabilities in support of economic and social development.

While selection of technologies is largely a matter of private entrepreneurs, LDC technological institutions can play an important role through their influence on macro-economic policies of the Government, advice to entrepreneurs on availability of alternative technologies, and supporting services to industry. Included in these services is the network of industrial research, extension, and standards institutes throughout the LDCs. Generally, AID will sponsor collaboration between U.S. and LDC technological institutes that work with private industry. Particular attention will be paid to stimulating commercially viable small scale industry, which tends to use more labor and less capital per unit of output.

(2) Other Programs: In addition to science and technology infrastructure, AID will also undertake two smaller activities under this program.

(a) Natural Resource Assessment and Management: Improved LDC capabilities for assessing the location and nature of their natural resources and for determining how these resources can best be developed is of great importance for development. This includes extractive resources such as minerals and clays and the renewable resources of water, soil, and forests. Attention will be given to faster, cheaper, and more effective techniques for identifying and appraising natural resources, as well as to improved techniques for managing natural resource development such as integrated land use planning, conservation of renewable resources, and pollution abatement and control. Particular attention will be paid to opportunities to advance knowledge of means for environmental protection.

AID's role in this field will be one of an agent or broker between the developing countries and U.S. experts, such as the organizations involved in the Earth Resources Technology Satellite (ERTS) program, and will avoid politically sensitive areas of commercial contracting to develop these resources.

(b) Reducing Public Investment Costs: AID will also explore, on a selective basis, technological innovations that can greatly reduce the costs of economic infrastructure activities that are heavy users of LDC public funds, such as public works, housing, transportation, communications, and energy development. Success here could release public revenues that could be applied to other development needs. Priority will be given to those activities which relate directly to the quality of life for the mass of the population such as water and sewage for low-income areas, low-income housing, and rural development.

Program Leadership

The Office of Science and Technology in the Technical Assistance Bureau (TAB/OST), in collaboration with the Office of Engineering and other central offices as appropriate, is responsible for Agency policy guidance and technical leadership in the areas identified above. It will:

- identify and help mobilize the technical inputs needed for appropriate analysis, design, and implementation of Regional and Mission projects in these sub-sectors and for closely related types of science and technology activity;
- coordinate and focus the use of Agency resources in research, institutional grants, and pilot programs to identify and establish innovative approaches to major problems impeding LDC development in these sub-sectors, manage the interregional components of such composite efforts, and provide technical advisory services to Regions and Missions on desirable linkages and content for related activities in their programs;
- mobilize, in collaboration with the Regional Bureaus, sufficient consultants and contractors from the most qualified elements of the U.S. science and technology community, to provide the services needed by the Agency in this sphere of activity; and

- provide technical liaison with interested international organizations and assist Regional Bureaus in providing such liaison for regional organizations, seeking more effective use of U. S. talent and experience by these organizations.

TAB/OST will give full consideration to Mission and Regional Bureaus' views regarding the timing and content of proposed field visits under this activity. Recognizing that limitations on Missions' staffing frequently make it difficult for them to arrange, participate in, monitor, or guide such contacts, the central staff and its intermediaries are expected to make their own arrangements for consultation when necessary. Missions are to be kept fully informed of proposed visits, asked to provide any advice they wish regarding the timing and content of the visit and to participate if they desire, and informed of the outcomes of consultations. Care is needed to assure that such visits are not used to distort LDC priorities or stimulate LDC requests for assistance that cannot be accommodated within the budget projections of the Mission, Regional Bureau, or Technical Assistance Bureau.

3. Administrator's Advisory Council Action on Science and Technology

On October 23, 1974 the AAC considered a paper on Science and the Transfer of Technology prepared by a Working Group, chaired by AA/TAB.

The paper's point of departure was the Secretary of State's recent initiatives committing the United States to expanded programs in Science and Technology with developing countries in recognition of the growing interdependence of national economies and the related global problems.

Specific examples of these initiatives include: the U.S. proposal for a Regional Commission on Science and Technology Transfer for Latin America, and the inclusion of Science and Technology Subgroups in the rapidly increasing number of bilateral Joint Commissions.

The AAC discussion on Science and Technology was divided into three basic areas: (1) AID countries; (2) non-AID or AID graduates, and (3) overall USG policy on Science and Technology Transfers to the LDCs.

The Council stressed the importance under each of the above headings of the interrelationship between priority sectors and technology transfer activities.

1. AID Countries

The AAC recognized the continuing and increasing need for accelerating scientific research and development of appropriate technology in the key sectors identified in Sections 103-105 of the FAA of 1973. An example here is the Agency's FY 1976 proposals for a new initiative to underwrite the development and financing of long-term agricultural research programs.

With regard to areas outside Sections 103-105, the AAC reaffirmed the relevance of Policy Determination 51 (Selected Aspects of Science and Technology) designed to supplement AID's priority programs in food production and nutrition, population and health, education, etc. PD-51 provides guidance for assisting developing countries with selected aspects of technological transfer and adaptation. It focuses primarily on:

- helping LDCs develop national science and technology policies and institutions with particular emphasis on local industrial development.

- Natural resource assessment and management--included are extractive mineral resources, energy resources, marine and land renewable resources.
- Reducing public investment costs.

2. Non-AID and "Graduate" Countries

This group includes: (1) a growing number of countries who have already made sufficient development progress or will in the near future so as to be ineligible for concessional assistance, and (2) the oil-rich countries who may be relatively low on the development scale, but they have the financial resources to help attain rapid development.

For both these groups of countries, their science and technology requirements can be largely met through: (a) increasing levels of foreign private investment which offer a package of technological transfers, training of key personnel, market development as well as the capital flows, and (b) government-to-government activities financed under Section 607 of the FAA which provides technical assistance on a reimbursable basis in any development sector.

The Latin American countries are particularly seeking technical assistance in the industrial sector. Consequently, the Working Group set up by the Meeting of Foreign Ministers has directed the subgroups meeting during the last six months to give attention to the industrial process. The Latin Americans want to strengthen indigenous capacity to select and develop technologies better suited to local resources and requirements; reduce their dependency on technologies of a foreign design and to be able to negotiate more intelligently with foreign suppliers of technology.

As indicated above, PD-51 specifically addresses this problem of assisting LDCs develop national policies and institutions that will permit better technological choices, particularly in industry.

For the oil-rich countries, utilizing Section 607, we could be responsive and draw upon our experience in scientific R&D and technology transfers in the three key sectors of the FAA as well as for industrial development.

3. USG Policy on Science and Technology Transfer to LDCs

The AAC discussed the need and possibilities for the greater use of USG agencies in addressing LDC problems through

cooperative programs in science and technology. Secretary Kissinger in his recent speeches has stressed the need to mobilize scientific and technical skills for more long-term analysis and policy prescription for extant and emerging global development problems.

The AID Working Group paper discussed a recent Congressional initiative in this area. Congressman Hanna, Chairman of a Subcommittee on Science and Astronautics, reported that there are some 24 USG agencies conducting a variety of science and technology activities which directly or indirectly bear upon developing countries. He estimated that as much as \$1.0 billion of the total research and development budgets of these U.S. agencies may involve expenditures relating to LDC problems. However, no separate statistics are kept on such expenditures and more importantly, there was little or no coordination of the various USG programs concerning LDC science and technology problems.

Congressman Hanna has introduced a bill to establish an Institute for Technology Transfer to Developing Countries within the National Science Foundation. The bill authorized an appropriation of \$50 million over a period of five years to be used primarily to subsidize telecommunications with developing countries through satellites and new institutions for cooperation in an international program for the collection and dissemination of scientific and technological information.

At the hearings on the bill in May 1974, the principal U.S. Government testimony was from the NSF (Dr. Stever, NSF Director) and AID (Joel Bernstein). Both witnesses recognized the need to improve technology transfer and that more and better work was needed on the information management aspects, but expressed doubt that the stress on large-scale transfer of technological information via satellites between multi-purpose data banks in the U.S. and LDCs was an efficient way to advance technology transfer.

The AID testimony suggested that it would be more productive:

a. To organize and strengthen problem-solving systems in which the most creative U.S. scientific and technical experts can collaborate with their developing country counterparts in working out better technologies to apply to the most important development functions of developing countries.

b. As an integral part of such efforts, to strengthen the specific information systems that are required to further the work in each major problem area.

c. To develop local capabilities of devising new technologies that meet local needs, by appropriate combinations of adaptation and invention, and of drawing on the world's technology information base to help in doing this.

d. To expand the technical and other management skills needed to select and use improved technology.

The AID testimony noted the responsibility for coordination via the Development Coordination Committee assigned to AID under the Foreign Assistance Act of 1973 and suggested that this mandate should be used for:

"Taking the leadership with other agencies to review the extent and importance of gaps in U.S. programs and policies affecting the transfer and utilization of science and technology going to developing countries, and to recommend cost effective measures to reduce these gaps and measures to strengthen coordination of the various U.S. Government efforts in this field."

AAC recommended that the Development Coordination Committee undertake a review of existing and proposed programs of USG agencies, e.g., NASA, AEC, NSF, etc., in an effort to determine how U.S. scientific and technical expertise can be more effectively engaged in a collaborative effort with IDCs to be applied to basic development problems.

4. Office of Science and Technology Projects

The descriptions of OST projects in this section are grouped within the three concentration areas singled out in the policy determination on science and technology: namely, science and technology institutional development, natural resources assessment and management, and reducing public investment costs.

A. Science and Technology Institutional Development

1. Strengthening Science and Technology Capabilities.

This project is conducted jointly by the National Academy of Sciences and the National Academy of Engineering with the purpose of encouraging more efficient LDC development of scientific and technological capabilities which meet national development requirements and more effective use of existing scientific and technological capabilities in support of economic and social development. The project is implemented through bilateral workshops and special studies under auspices of the NAS/NAE Board on Science and Technology for International Development. The level of effort currently is \$825,000/year. OST project monitor: W. H. Littlewood.

2. Policies for Science and Technology in Developing Countries

This project is conducted by Cornell University under a five-year, section 211(d) grant of \$580,000 with the purpose of strengthening the university's capabilities for education and technical assistance to developing countries related to more effective utilization of science and technology in development planning and implementation. The grant was made in 1972. OST project monitor: W. H. Littlewood.

3. Scientists and Engineers in Economic Development

This project is conducted through research, teaching, and travel grants to U.S. university faculty members by the National Science Foundation with the purpose of facilitating professional collaboration between U.S. and LDC university scientists and engineers on development problems and strengthening institutional ties. The level of effort currently is \$200,000/year. OST project monitor: John Fry.

4. Small Grants for University Research

This project is conducted through small dollar grants to LDC university scientists by The Fund for Overseas Research Grants and Education with the purpose of encouraging more effective coupling

of LDC university research activities with national development problems of government, agriculture, and industry. This is a four-year project initiated in FY 1973 with an estimated total budget of \$310,000. Grants average about \$3,000. OST project monitor: John Fry.

5. Engineering Education

This project, beginning in FY 1975, provides support for both the 1975 World Congress on Educating Engineers for World Development and the Geotechnical Engineering Center, National School of Engineering of Tunis for purposes of orienting LDC engineering capabilities toward the priority problems of national development and improving access and linkages between U.S. and LDC engineering schools. The level of effort in FY 1975 is \$100,000. OST project monitor: Merrill Conitz.

6. Technical Information

This project is conducted by the National Technical Information Service of the U. S. Department of Commerce to facilitate the access of developing countries to U.S. research and development results which might be most useful to them in achieving national development goals. A secondary purpose is to establish and strengthen linkages between NTIS and LDC scientific and technical information services. The current level of effort is \$120,000/year. OST project monitor: John Fry.

7. Industrial Standards

This project is conducted by the National Bureau of Standards with the purpose of assisting developing countries through surveys, workshops, distribution of standards literature and reference materials, and special training to improve their institutional competence in standardization, quality control, and measurement services to benefit domestic commerce and export expansion. The current level of effort is \$160,000/year. OST project monitor: John Fry.

8. Training Research Managers

This project is conducted under contract with Denver Research Institute for the purpose of developing, testing and institutionalizing in selected developing countries short-term executive training programs designed to improve the technical and administrative abilities of senior staff of industrial research institutes responsible for planning, marketing and supervising industrial projects, particularly to assist in directing projects toward national priorities and industrial needs. The current level of effort is \$95,000/year. OST project monitor: Clint Stone.

9. Coupling with Industry

This project is conducted through grants to selected LDC industrial research institutes administered by Denver Research Institute with the purpose of demonstrating new approaches to commercializing products of research at these institutes. Other purposes are to stimulate closer coupling of institute programs with industrial interests and strengthen their capabilities to recognize and respond to commercial opportunities for products of their research. The current level of effort is \$200,000/year. OST project monitor: Clint Stone.

10. Technology Adaptation

This project is conducted by the Massachusetts Institute of Technology under a five-year, section 211(d) grant of \$900,000 with the purpose of strengthening the university's capabilities for education and technical assistance to developing countries related to adapting technology to LDC needs and processes by which technological knowledge and skills can be introduced. The grant was made in 1972. OST project monitor: Clint Stone.

11. Employment Through Small Industry

This project is conducted by the Georgia Institute of Technology under a five-year, section 211(d) grant of \$800,000 with the purpose of strengthening the university's capabilities for education and technical assistance to developing countries related to technological choice for increasing employment and national productivity. The project should generate improved understanding of employment effects of various technologies, technological innovations which can stimulate employment in rural areas, and technologies for increasing value added locally to national products. The grant was made in 1973. OST project monitor: W. H. Littlewood.

12. Small Industry Grants

This project provides for financial grants from the Georgia Institute of Technology to linkage institutions in Brazil and Korea. The grants demonstrate alternative technical assistance approaches to small industry through various kinds of assistance to employment-generating small industry, particularly in rural areas. This is a five-year project commencing in FY 1974 with an estimated total cost of \$850,000. OST project monitor: W. H. Littlewood.

B. Natural Resources Assessment and Management

1. Management of Natural Resources

This project is conducted by the University of Arizona under a five-year, section 211(d) grant of \$1,045,000 with the purpose of strengthening the university's capabilities for education and technical assistance to developing countries related to regional resource and environmental planning. Particular emphasis is given to the economic and conservation aspects of reconciling conflicting demands on limited land, water, forest, mineral, energy, and other natural resources. The grant was made in 1974. OST project monitor: Bill Long.

2. Remote Sensing

This project is conducted under contract with the Environmental Research Institute of Michigan with the purpose of broadening understanding and facilitating utilization of remote sensing, particularly products of the ERTS 1 and LANDSAT 2 systems, in developing countries. The project is implemented through competitive grants and technical assistance to LDC institutions for experimental applications in agriculture, range management, forestry, hydrology, and related regional planning and resource management projects. The current level of effort is \$200,000/year. OST project monitor: Merrill Conitz.

3. Remote Sensing Census Project

This project is conducted by the Bureau of the Census to test the usefulness of satellite remote sensing imagery in planning and implementing census and related statistical programs in Afghanistan, Kenya, and Bolivia. Through mapping and new land use population relationships derived from the imagery for monitoring population change, the technology may make it possible to achieve cost and time savings in future LDC census operations. This is a five-year project initiated in 1972 with total funding of \$1,000,000 provided by A.I.D.'s Bureau of Population and Humanitarian Assistance. OST project monitor: John Fry.

4. Geobotanical Remote Sensing

This research project is conducted by the U.S. Geological Survey to determine the technical feasibility of using vegetative indicators detected by remote sensing as a basis for identifying potential metalliferous ore deposits in heavily vegetated tropical areas. Particular emphasis is given to appropriate methods for LDC

utilization. This is a four-year project initiated in 1973 with a total budget of \$780,000. OST project monitor: Bill Long.

5. Environmental Training

This project is conducted by the University of North Carolina with supplementary support from UNIDO, PAHO, and the UN Environmental Program with the purpose of demonstrating how U.S. knowledge and experience can be focused to train LDC policy makers, planners, managers, and educators in techniques of predicting, evaluating, and controlling environmental problems associated with development activities. This is a four-year project initiated in 1972 with a total budget of \$370,000. OST project manager: Bill Long

6. Environmental Economics

This project is conducted under contract by Ralph Stone and Company, Inc. with the purpose of developing through case studies an analytical methodology for evaluating benefits and financial costs of various environmental safeguards for developing countries. A guidebook on technologies and costs necessary to achieve different levels of environmental protection will be prepared. This is a two-year project initiated in 1974 with a total budget of \$125,000. OST project monitor: Bill Long.

7. Use of Secondary Woods

This research project is conducted by the Forest Products Laboratory of the U.S. Forest Service to demonstrate the economic, technical, and commercial feasibility of utilizing mixed secondary tropical woods in developing countries for production of paper and pulp and also paperboard and fiberboard on a commercial scale. This is a three-year project initiated in FY 1975 with an estimated total budget of \$600,000. OST project monitor: W. H. Littlewood.

C. Reducing Public Investment Costs

1. Low-Cost, Typhoon Resistant Structures

This research project is conducted by the National Bureau of Standards in collaboration with the University of the Philippines and thirteen additional Philippine institutions to develop, test, and provide technical information related to improvements in low-cost housing construction which will result in their increased resistance to extreme winds in the Philippines, Bay of Bengal, and Caribbean areas. This is a four-year project initiated in FY 1973 with an estimated total budget of \$645,000. OST project monitor: W. H. Littlewood.

2. Low Cost Roofing

This research project is conducted under contract with the Monsanto Research Corporation to develop alternative roofing materials for developing countries which can be made with local material and labor and compete in cost, performance and appearance with less adequate materials, such as galvanized corrugated steel. This is a five-year project initiated in FY 1973 with an estimated total budget of \$665,000. OST project monitor: W. H. Littlewood.

3. Sulphur Bonding

This research project is conducted under contract with Southwest Research Institute to compare sulphur bonding with conventional mortar wall construction techniques for housing in Colombia and two other developing countries in terms of wall construction costs, durability, and strength. This is a three-year project initiated in FY 1974 with an estimated total budget of \$245,000. OST project monitor: Merrill Conitz.

4. Transportation Planning

This research project is conducted under contract with the Massachusetts Institute of Technology with the purpose of developing an improved approach for use in developing countries in evaluating alternatives and reaching investment decisions on low volume road construction and maintenance. This is a three-year project initiated in FY 1974 with an estimated total budget of \$442,000. OST project monitor: John Fry.

A number of OST projects have been completed in the past two years or are near completion now. These are:

-- a project conducted by the Atomic Energy Commission in collaboration with the Pakistan Atomic Energy Commission on the Role of Sister Laboratories in Economic Development;

-- a project conducted by Cornell University in collaboration with the Instituto de Fomento y Asesoria Municipal of Costa Rica on Science Policy in a Small Developing Nation;

-- a project conducted by NASA and the Illinois Institute of Technology Research Institute in collaboration with the Korean Institute of Science and Technology on Application of Industrial Technology Developed under NASA Auspices to the Needs of a Developing Country;

-- a project conducted by the National Bureau of Standards on More Effective Use of Computer Technology in Developing Countries;

-- a small research project on Utilization of Research Reactors in Developing Countries;

-- a project conducted by the National Oceanographic Data Center in collaboration with UNESCO on Strengthening the Capability of Developing Countries to Acquire Information about Ocean Resources;

-- a research project conducted by the University of Notre Dame in collaboration with the International Center of Insect Physiology and Ecology in Nairobi on Ecological Aspects of Genetic Control of Aedes Aegypti Mosquitoes;

-- a small research project conducted by the U.S. Forest Service on a Survey of Knowledge Regarding Properties and Uses of Secondary Tropical Woods;

-- a project conducted by the Massachusetts Institute of Technology on Selection of Communications Technologies by Developing Countries;

-- a project conducted by Arthur D. Little, Inc. in collaboration with institutions in Colombia, Philippines, and Ghana on Reducing Costs of Public Works;

-- a small research project conducted by Arthur D. Little, Inc. entitled An Overview of Alternative Energy Sources for LDCs;

-- a research project conducted by the National Bureau of Standards in collaboration with institutions in Peru, Philippines and Turkey on Design, Siting, and Construction of Low-Cost Housing and Community Buildings to Better Withstand Earthquakes and Windstorms;

-- a project conducted by the Smithsonian Institution in collaboration with institutions in Korea, Ghana, and Indonesia entitled Case Studies on Environmental Impact of Selected Development Projects;

-- a project conducted by a consortium of U.S. universities in collaboration with the Central American Research Institute for Industrial Technology on Techniques for Improving the Contribution of Research to Industrial Development;

-- a grant project conducted in conjunction with Howard University involving a two semester lecture program on Technology and Development;

-- a small research project conducted by Denver Research Institute for a comparative evaluation of LDC industrial research institutes; and

-- a small grant to assist in establishing the World Association of Industrial and Technological Research Organizations.

Four additional OST projects will soon be ready for implementation. These are:

-- a small research project on ultra low-cost housing;

-- a project in cooperation with the Environmental Protection Agency on water pollution control;

-- a small research project on the design of solar kilns; and

-- a summer educational program at Cornell University for developing country students.

The overall budget for Office of Science and Technology activities is:

	<u>FY 1973</u>	<u>FY 1974</u> (thousands)	<u>FY 1975</u> <u>Estimated</u>
General Technical Services	\$ 1,906	\$ 2,004	\$ 2,325
Research	375	1,277	1,255
211(d) Grants	<u>800</u>	<u>1,045</u>	<u>50</u>
<u>TOTAL</u>	<u>\$ 3,081</u>	<u>\$ 4,326</u>	<u>\$ 3,630</u>

5. Office of Science and Technology
Publications List

	<u>NTIS Number</u>
<u>I. Office of Science and Technology Staff Reports</u>	
1. Environmental Considerations for Construction Projects, TA/OST 71-1.	PB 203 326
2. Environmental Problems in Selected Developing Countries (Preliminary Survey), TA/OST 71-2.	PB 203 380U
3. Role of Remote Sensing in Developing Countries, TA/OST 71-3.	PB 203 309
4. Water Quality Standards and International Development, TA/OST 71-4.	PB 204 408
5. Economic Damage Caused by Aquatic Weeds (Preliminary Survey), TA/OST 71-5.	PB 206 905
6. Workshop on Science and Technology Priorities for International Development, TA/OST 71-6.	PB 206 752
7. Science and Technology for International Development: A Selected List of Information Sources in the United States, TA/OST 72-7.	PB 210 104
8. The Role of AID in the Field of Natural Resources Planning and Management, TA/OST 72-8.	PB 210 105
9. Technology and Economics in International Development: Report of a Seminar, TA/OST 72-9.	PB 211 192
10. Desert Encroachment on Arable Lands: Significance, Causes, and Control, TA/OST 72-10.	PB 211 367
11. Appropriate Technologies for International Development. Preliminary Survey of Research Activities, TA/OST 72-11.	PB 212 288
12. Forestry in Developing Countries: Potentials, Constraints, and Opportunities (Preliminary Survey), TA/OST 72-12.	PB 212 726
13. The Application of Geochemical, Botanical, Geophysical, and Remote Sensing Mineral Prospecting Techniques to Tropical Areas (State of the Art and Research Priorities), TA/OST 72-13.	PB 213 230

	<u>NTIS Number</u>
14. Impact on the United States Economy of Transfers of Technology (Pilot Program in Korea), TA/OST 72-14.	**
15. Remote Sensing: A Development Framework and Case Studies, TA/OST 73-15.	PB 214 361
16. RANN Program: Potential Benefits to Developing Countries, TA/OST 73-16.	PB 214 862
17. Techniques for Assessing Hydrological Potentials in Developing Countries (State of the Art and Research Priorities), TA/OST 73-17.	PB 215 149
18. Policies and Programs in Selected Areas of Science and Technology, TA/OST 73-18.	PB 218 816
19. Developing Country Coverage of Earth Resources Technology Satellite, ERTS-1: July 1972 - June 1973 (for each of 68 developing countries), TA/OST 73-19.	**
20. Utilization of Tropical Forests (A Review of the Forestry Literature in the Agency for International Development Reference Center), TA/OST 73-20.	PB 229 822
21. Technological Opportunities for Tropical Forestry Development, TA/OST 73-21.	PB 229 843
22. Factors Influencing the Utilization of Tropical Wood Species, TA/OST 73-22.	PB 230 738/AS
23. Development of the Tropical Wood Resource, TA/OST 73-23	PB 231 006/AS
24. Physical, Mechanical, and Other Properties of Selected Secondary Species in Surinam, Peru, Colombia, Nigeria, Gabon, Philippines, and Malaysia, TA/OST 73-24.	PB 231 894/AS

NTIS Number

- II. National Academy of Sciences/National Academy of Engineering Reports
1. International Aspects of Man's Effect Upon the Environment, January 1970. PB 203 379
 2. The International Development Institute, July 1971. PB 203 331
 3. Solar Energy in Developing Countries: Perspectives and Prospects, March 1972. PB 208 550
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 5. Ferrocement: Applications in Developing Countries, February 1973. PB 220 825
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 7. U. S. International Firms and R, D, & E in Developing Countries, 1973. PB 222 787
 8. Research Management and Technical Entrepreneurship: A U.S. Role in Improving Skills in Developing Countries, 1973. PB 225 129/6AS
 9. Meeting the Challenge of Industrialization: A Feasibility Study of an International Industrialization Institute, 1973. PB 228 348
 10. Annual Report of the Board on Science and Technology for International Development, National Academy of Sciences, 1973. **
 11. National Academy of Sciences: International Development Programs of the Office of the Foreign Secretary, Summary and Analysis of Activities, 1961-1971. **
 12. East Pakistan Land and Water Development as Related to Agriculture, January 1971. PB 203 328

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| 13. Conservacion del Medio Ambiente Fisico y el Desarrollo, Proceedings of the Central American Workshop on the Environment and Development, July 25-30, 1971, published by ICAITI (in Spanish). | PB 217 119 |
| 14. Report on the Central American Workshop on the Environment and Development, July 25-30, 1971 (staff summary) | ** |
| 15. Research Priorities and Problems in the Execution of Research in Ghana, Part I-- Summary, and Part II--Full Report, Proceedings of the Workshop on Research Priorities and Problems in the Execution of Research in Ghana, January 4-9, 1971, published by CSIR. | PB 203 329
PB 203 330 |
| 16. Report of the Joint U.S.A. 'Ghana Committee on Agricultural Extension and Research, September 27 - October 8, 1971, published by CSIR. | PB 208 605 |
| 17. Workshop on the Role of the Council for Scientific and Industrial Research in Determining Science Policy and Research Priorities, Accra, Ghana, March 18-31, 1973. Final Report. Published by the Council for Scientific and Industrial Research of Ghana. | PB 223 310 |
| 18. Report of a Workshop on Research Priorities and Problems in the Execution of Research in Ghana, January 18-22, 1971. (staff summary) | ** |
| 19. Report of the Indo-U.S. Workshop on the Management and Organization of Industrial Research, March 2-6, 1970. | PB 203 311 |
| 20. Summary Report of Workshop on "Water in Man's Life in India," September 13-17, 1971. (staff summary) | ** |
| 21. Summary Report of an Indonesia-U.S. Workshop on Industrial and Technological Research, January 25-30, 1971. (staff summary) | PB 204 266 |

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| 22. Report on the LIPI-NAS Workshop on Industrial and Technological Research, Jakarta, Indonesia, January 25-30, 1971, 3 volumes. Published by Lembaga Ilmu Pengetahuan Indonesia. | PB 217 118
PB 218 724
PB 222 457 |
| 23. A Report on the LIPI-NAS Workshop on Natural Resources, Jakarta, Indonesia, September 11-16, 1972. Volume I: Overall Findings and Recommendations; Volume II: Working Group Reports. Published by Lembaga Ilmu Pengetahuan Indonesia. | PB 217 293
PB 203 371 |
| 24. Regional Workshop on Water Resources, Environment and National Development, March 13-17, 1972. 2 volumes. Published by Science Council of Singapore. | PB 217 117
PB 235 270/AS |
| 25. Summary Report of a Regional Workshop on Water Resources, Environment and National Development, Singapore, March 13-17, 1972. | ** |
| 26. Workshop on Science Planning and Policy in Thailand, Bangkok, Thailand, July 3-6, 1972. Final Report. Printed by National Research Council of Thailand. | PB 224 441 |
| 27. Summary Report of the NAS-NRC Workshop on Science Planning and Policy in Thailand, Bangkok, Thailand, July 3-6, 1972. (staff summary) | ** |
| 28. A Seminar on Protein Food Promotion, Bangkok, Thailand, November 22-December 1, 1971. | ** |
| 29. Status Report to the USAID Mission in Brazil - U.S.-Brazil Joint Study Group Activities - period July 1970-December 1970. | ** |
| 30. Recommendations for Improving Computer-Science Education in Brazil: Summary Report of the NAS-CNPq Study Group on Computer-Science Education in Brazil, Rio de Janeiro, Brazil, December 10-15, 1971. | ** |

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32. Science and Technology in Sao Paulo's Development, July, 1972. **
33. Study for Agricultural Engineering Development in Brazil: Report of the Joint Study Group on Agricultural Engineering in Brazil, July 24-August 12, 1972. PB 214 534
34. Science and Brazilian Development: Report of the Fourth Workshop on Contributions of Science and Technology to Development, Washington, D. C., November 1-5, 1971. PB 210 345
35. Summary Report of the Workshop on Aquatic Plants: Management and Utilization, Georgetown, Guyana, March 15-17, 1973. (staff summary) **
36. Staff Summary Report on the Colombia-U.S. Study Panel on the Potential for Graduate Education and Research in Engineering, Physics, and Applied Geology in Colombia, Bogota, Colombia, February 14-25, 1972. (staff summary) **
37. General Report of the Colombia-U.S. Study Group on the Potential for Graduate Education and Research in the Biological Sciences in Colombian Universities, Bogota, Colombia, May 29-June 13, 1972. (staff summary) **
38. Staff Summary Report--Program for the Improvement of Graduate Education and Research in Colombian Universities in the Sciences and Engineering. (staff summary of activities under Task Order #5) **
39. Report of a COLCIENCIAS-NAS Panel Study of Graduate Education and Research in Chemistry in Colombia, February 22-27, 1971. **
40. Report of a COLCIENCIAS-NAS Panel Study of Graduate Education and Research in Mathematics in Colombia, March 15-20, 1971. **

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41. Summary Report of the Workshop on the Contribution of Science and Technology to Development, Santiago, Chile, January 11-15, 1971. (staff summary) **
42. Preliminary Assessment of Some Problems of the Hydrogeology of the Dry Pampas in Buenos Aires Province, Argentina; Trip Report, September 1970. **
43. Report of the Joint Study Group on Geological Training and Research in the Republic of Zaire, Kinshasa, Republic of Zaire, July 20-August 1, 1972. **
44. Report of the Joint Study Group on Demographic Training and Research in the Republic of Zaire, Kinshasa, Republic of Zaire, January 24-28 1972. **
45. Rapport et Recommendations du Colloque entre la NAS et l'ONRD sur les Problemes de Recherches et de Formation Demographiques, Kinshasa, 25-28 janvier 1972. (in French) **
46. Summary Report of Activities of the NAS Advisory Panel to the Ministry of Science and Technology, Republic of Korea, January 10-21, 1972. (staff summary) **
47. NAS Advisory Committee on Technological Innovation and Monitoring, Progress Report to NAS-NRC Governing Board meeting of February 6, 1972, made available to AID for distribution to Missions for their information. **
48. Summary Minutes of Meetings of the Board on Science and Technology for International Development (June and December 1970 and March 1971). **
49. Summary Minutes of Meetings of the Board on Science and Technology for International Development (October 21-22, 1971). **

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50. Summary Report of Workshop on the Role of Science and Technology in the Economic Development of the Democratic Republic of the Congo during the 1970's, June 7-11, 1971. (staff summary) **
51. Summary Report of the NAS-LIPI Workshop on Natural Resources in Indonesia, Jakarta, Indonesia, September 11-16, 1972. (staff summary) **
52. Summary Minutes of Meetings of the Board on Science and Technology for International Development (October 1-2, 1972). **
53. Summary Minutes of Meeting of the Board on Science and Technology for International Development (April 26, 1973). **
54. Anniversary Report of the Board on Science and Technology for International Development. April 1, 1970-March 31, 1971. **
55. Anniversary Report of the Board on Science and Technology for International Development. April 1 1971-March 31, 1972. **
56. Summary Minutes of the Meeting of the Board on Science and Technology for International Development. October 22, 1973. **
57. Some Prospects for Aquatic Weed Management in Guyana. Workshop on Aquatic Weed Management and Utilization, Georgetown, Guyana, March 15-17, 1973. Published by National Science Research Council of Guyana. PB 228 660/AS
58. Summary Report of the First Meeting and Workshop of the Korea-U.S. Joint Continuing Committee for Scientific Cooperation. Seoul, Korea, November 13-16, 1973. (staff summary) PB 235 458/AS
59. Summary Report of NAS-CONICET Science Cooperation Program, August 15, 1970 - December 31, 1972. (staff summary report of activities) **

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60. Summary Report of NAS-CNPq Science Cooperation Program, February 1968 - December 1972. (staff summary report of activities) **
61. International Development Programs of the Office of the Foreign Secretary, 1973. PB 230 543/AS
62. Roofing in Developing Countries - Research for New Technologies, 1974. PB 234 503/AS
63. Food Science in Developing Countries: A Selection of Unsolved Problems, 1974. PB 235 410/AS
64. More Water for Arid Lands: Promising Technologies and Research Opportunities, 1974. *
65. Staff Summary Report: Workshop on Education and Training Needs for Environmental Programs in the Philippines. Manila, Philippines, May 27-31, 1974. (staff summary) *
66. Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan). Report of a Sino-U.S. Workshop held in Washington, D. C. 24-26 April 1973-74. *
67. Workshop on Education and Training Needs for Philippine Environmental Programs. 27-31 May 1974. Manila, Philippines. *

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2. Metrology and Standardization in Less-Developed Countries: The Role of a National Capability for Industrializing Economies. December 1971. NBS SP 359. COM 72 50044
3. A Report on a Survey in Ecuador on Standardization and Measurement Services in Support of Industrialization Goals. May 1-12, 1972. NBS 10 881. COM 73 10326
4. Report to AID on the NBS/AID Workshop for the Survey Team of National Capabilities for Standardization and Measurement Services in Industrializing Economies. April 23-28, 1972. NBS 10 901. PB 222 554
5. National Program of Metrology for Ethiopia. NBS 10 927. PB 222 533
6. Standardization and Measurement Services in Turkey. October 14-28, 1972. NBSIR 73-172. COM 73 11175
7. Standardization and Measurement Services in Korea. June 19-30, 1972. NBSIR 73-185. COM 73 11287
8. Report to AID on an NBS/AID Workshop on Standardization and Measurement Services in Industrializing Economies. May 4-18, 1973. NBSIR 73-275. COM 74 1026
9. Research Study on the Socio-Economic Aspects of Low-Cost Housing in the Philippines. May, 1972. (Subcontractor's report) **
10. Report to AID on an NBS/AID Workshop on Standardization and Measurement Services in Industrializing Economies, May 11-24, 1974. COM 74 11721/AS

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11. Guidelines for the Use of Computer Technology in the Developing Countries. NBS Report 73-423. December 1973. COM 74 11722/AS
12. Design, Siting, and Construction of Low-Cost Housing and Community Buildings to Better Withstand Earthquakes and Windstorms. NBS Report BSS-48. January 1974. ***
13. FY 1973 Progress Report on Design Criteria and Methodology for Construction of Low-Rise Buildings to Better Resist Typhoons and Hurricanes. NBSIR 74-582. July 2, 1973. *
14. FY 74 Progress Report on Design Criteria and Methodology for Construction of Low-Rise Buildings to Resist Typhoons and Hurricanes. NBSIR 74-567. July 1, 1974. *
15. Development of Improved Design Criteria to Better Resist the Effects of Extreme Winds for Low-Rise Buildings in Developing Countries. NBS Building Science Series 56. *
16. The Role of Standard Reference Materials in Measurement Systems. NBS Monograph 148. *

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| 6. Application of Modern Technologies to International Development. April 1973. AID-OST 73-2. | PB 220 385 |
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V. Other Organizations

1. Proceedings of the Symposium on Potential Application of Remote Sensing to Economic Development in Developing Countries. Smithsonian Institution. November 19-20, 1970 (TA/OST/SM-70-1). PB 203 327
2. Computer Technology in Developing Countries. American University. March 22-23, 1971. (TA/OST/AU-71-1). PB 203 327
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6. Technical-Economic Consideration in Public Service Broadcast Communications for Developing Countries. Massachusetts Institute of Technology, 1973. PB 223 266
7. Asian Seminar and Workshop on Remote Sensing held at University of the Philippines, May 7-18, 1973. U.S. Geological Survey. September 1973. PB 237 155/AS
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9. International Program in the Environmental Aspects of Industrial Development (IPEAID), January 22 - April 2, 1973. University of North Carolina at Chapel Hill. 1973. **
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11. Achievement of Opportunities to Reduce Construction Costs in Public Highways, Report of the Ad-Hoc Group. Volume I. Arthur D. Little, Inc. April 1973. **
12. Achievement of Opportunities to Reduce Construction Costs in Public Highways, Report of the Ad-Hoc Group. Volume II, Appendices. Arthur D. Little, Inc. April 1973. **
13. Methodology for Achieving Cost Reductions in Public Construction, the Colombia Phase, Interim report to the Agency for International Development. Arthur D. Little, Inc. October 1972. **
14. Achievement of Opportunities to Reduce Construction Costs in Public Works, Report of the Ad-Hoc Group. Arthur D. Little, Inc. October 1972. Circulation Restricted. **
15. The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey. Program on Policies for Science and Technology in Developing Nations, Cornell University, Ithaca, New York. October 1973. PB 226 621/AS
16. First Annual Report of the Program on Policies for the Application of Science and Technology in Developing Nations, August 11, 1971 - August 10, 1972. Cornell University. 1972. PB 236 880/AS

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| 17. Policies for the Application of Science and Technology to Development, Report of a Symposium, May 7-10, 1973. Cornell Univeristy. 1973. | PB 226 279 |
| 18. Strengthening Capabilities of Developing Countries to Acquire, Process and Utilize Information about Ocean Resources. National Oceanographic Data Center. December 1973. | PB 227 499/AS |
| 19. Seminar Series - Technology and Development School of Engineering, Howard University. May 30, 1974. Vols. I and II. | PB 233 083/AS
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| 20. First EROS/AID International Course on Remote Sensing. U.S. Geological Survey. May 1974. | PB 236 512/AS |
| 21. The Sahelian Zone Remote Sensing Seminar/ Workshop at Bamako, Mali, West Africa, April 17-28, 1973. U.S. Geological Survey. April, 1974. | PB 236 657/AS |
| 22. An Economic Evaluation of the Utility of ERTS Data for Developing Countries. Environmental Research Institute of Michigan. August 1974. Vols I and II. | PB 236 600/AS
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| 23. Second EROS/AID International Course on Remote Sensing. U.S. Geological Survey. November 1974. | * |
| 24. Development of Low-Cost Roofing from Indigenous Materials in Developing Countries. Monsanto Research Corporation. July 30, 1974. | * |
| 25. An Overview of Alternative Energy Sources for LDCs. Arthur D. Little, Inc. August 7, 1974. | * |

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8. Problem-Solving Networks

Many OST projects require close professional collaboration with LDC science and technology institutions and thereby are contributing to development and expansion of problem-solving networks for more effective use of science and technology for development. Other projects serve through workshops and training to broaden awareness and understanding of alternative technological choices for development. Developing country institutions collaborating on OST projects and countries participating in various information programs are identified for each project in this section.

A. Science and Technology Institutional Development

1. Strengthening Science and Technology Capabilities

Brazil - Conselho Nacional de Pesquisas (CNPq)
Financiadora de Estudos e Projetos (FINEP)
Brazilian Academy of Sciences
Empresa Brasileira de Pesquisa Agropecuaria
(EMBRAPA)

Central America (Regional) -

ICAITI (Central American Research Institute
for Industrial Technology)

Chile - National Commission for Scientific and Technical
Research (CONICYT)

Colombia -

Colombian Fund for Scientific Research and
Special Projects "Francisco Jose de Caldas"
(COLCIENCIAS)

Ghana - Council for Scientific and Industrial Research (CSIR)
Universities of Ghana, Kumasi, and Cape Coast

Guyana - National Science Research Council of Guyana

India - Indian National Science Academy (INSA)

Indonesia -

Council of Sciences for Indonesia
Indonesian Institute of Sciences (LIPI)

Korea - Ministry of Science and Technology (MOST)
Korea Atomic Energy Research Institute
Korea Energy Management Association
Industrial Advancement Administration of the
Ministry of Commerce and Industry
Oceanographic Research and Development Institute

Peru - Consejo Nacional de Investigacion (National
Research Council)
Peruvian Association for the Advancement
of Science
Peruvian Institute for Industrial Technological
Research and Technical Standards (IPINTEC)
Peruvian Academy of Sciences

Philippines -

National Pollution Control Commission
National Science Development Board (NSDB)
Council for Economic Development
Economic Development Foundation

Thailand -

National Research Council
National Economic and Social Development
Board (NESDB)
Institute of Food Research and Product
Development (Kasetsart University)
Asian Institute of Technology (AIT)

Zaire - Institute for Scientific Research in Central
Africa (IRSAC)
Office Nationale de la Recherche et du
Developpement (ONRD)

2. Policies for Science and Technology in Developing
Countries

Korea Advanced Institute of Science (KAIS).
Additional linkages are being developed with
institutions in Costa Rica, Colombia, Ghana, Brazil,
and Peru.

3. Scientists and Engineers in Economic Development

The National Science Foundation has awarded teaching/research grants for senior U.S. university faculty at a number of developing country institutions:

Federal University of Rio Grande do Sul
Porto Alegre, Brazil

University of Costa Rica, San Jose, Costa Rica

Middle East Technical University
Ankara, Turkey

Pusan National University
Pusan, Korea

Sogang University
Seoul, Korea

International Centre of Insect Physiology
and Ecology (ICIPE)
Nairobi, Kenya

University of Nairobi, Nairobi, Kenya

Instituto Venezolano de Investigaciones Cientificas
Caracas, Venezuela

Escuela Politecnica Nacional
Quito, Ecuador

University of Lima, Lima, Peru

Middle East Technical University
Ankara, Turkey

Universidade Federal de Bahia
Salvador, Brazil

Institute of Nutrition of Central America
and Panama, Guatemala City, Guatemala

Bogazici University, Istanbul, Turkey

Korean Institute of Science and Technology
Seoul National University
Seoul, Korea

University of Ibadan, Ibadan, Nigeria

G. B. Pant University, Pantnagar, India

Building and Road Research Institute and
University of Science and Technology
Kumasi, Ghana

Institute for the Promotion of Teaching
Science and Technology, Bangkok, Thailand

Gecaga Institute of Tropical Comparative
Endocrinology, Nairobi, Kenya

Trebhuvan University, Kathmandu, Nepal

University of Dolle Valle, Cali, Colombia

Catholic University of Valparaiso
Valparaiso, Chile

International Potato Center, Lima, Peru

University of Sao Paulo, Sao Paulo, Brazil

4. Small Grants for University Research

Twenty-four small grants for development oriented research have been awarded by FORGE to university principal investigators in Peru, Colombia, Turkey, Vietnam, Thailand, and Panama.

5. Engineering Education

Dr. Kokhtar Latiri, Director
National School of Engineering of Tunis
Tunis, Tunisia

6. Technical Information

The National Technical Information Service has formal agreements with the following developing country organizations concerning the transfer of scientific and technical information:

Fondo Colombiano de Investigaciones Cientificas,
Bogota, Colombia

Centro de Desarrollo Industrial del Ecuador
Guayaquil, Ecuador

Korea Scientific and Technological Information
Center, Seoul, Korea

Development Academy of the Philippines
Manila, Philippines

Thai National Documentation Center
Bangkok, Thailand

Instituto Nacional de Tecnologia
Rio de Janeiro, Brazil

Instituto Peruano de Fomento Educativo
Lima, Peru

7. Industrial Standards

The National Bureau of Standards is participating in an expanding problem-solving network involving numerous LDC standards institutions:

Industrial Advancement Administration
Seoul, Korea

Instituto Ecuatoriano de Normalization
Quito, Ecuador

Turkish Standards Institution
Ankara, Turkey

Department of Science, Ministry of Industry
Bangkok, Thailand

Directorate General of Standardization and Technology
Ministry of Commerce, Industry and Tourism
La Paz, Bolivia

Philippine Bureau of Standards
Department of Commerce and Industry
Manila, Philippines

Ethiopia Standards Institute
Addis Ababa, Ethiopia

Colombia Institute for Technical Standards
Bogota, Colombia

Central American Institute for Research
and Industrial Technology
Guatemala City, Guatemala

Panamanian Commission for Industrial and Technical
Standards, Panama City, Panama

Institute for Technological Industrial Research
and Technical Standards, Lima, Peru

Brazilian Association for Technical Standards
Rio de Janeiro, Brazil

Workshops at the National Bureau of Standards on standardi-
zation and measurement services for developing countries have
included senior representatives from standards institutions of the
following countries:

Ecuador	Nigeria
Korea	Vietnam
Turkey	Bolivia
Mexico	Philippines
Malaysia	Republic of China
Ghana	Honduras
Kenya	Panama
Brazil	Ethiopia
Trinidad and Tobago	Pakistan
Jamaica	Costa Rica
Venezuela	Chile
Sri Lanka	Indonesia

8. Training Research Managers

The Denver Research Institute has established informal
linkages with the following LDC institutions for this project:

Technological Research Institute
Applied Scientific Research Corporation of Thailand
Bangkok, Thailand

Scientific and Technological Research Council
of Turkey, Ankara, Turkey

Instituto de Pesquisas Tecnologica
Sao Paulo, Brazil

9. Coupling with Industry

Denver Research Institute has formal linkages with four developing country institutions for this project. These are:

Federal Institute of Industrial Research
Ikeja, Lagos, Nigeria

Institute de Investigaciones Tecnologicas
Bogota, Colombia

Middle East Technical University
Ankara, Turkey

Pakistan Council of Scientific and Industrial
Research, Karachi, Pakistan

10. Employment Through Small Industry

Soong Jun University, Seoul, Korea

Institute for Small Scale Industry
University of the Philippines
Quezon City, Philippines

Fundacao Educacional do Sul de Santa Catarina
Santa Catarina, Brazil

Centro de Desarrollo Industrial del Ecuador
Quito, Ecuador

University of Ife
Ilf-Ife, Nigeria

11. Small Industry Grants

Fundacao Educacional do Sul de Santa Catarina
Santa Catarina, Brazil

Soong Jun University, Seoul, Korea

B. Natural Resources Assessment and Management

1. Management of Natural Resources

The University of Arizona is planning cooperative programs with at least one institution in Kenya, Ghana, and three other arid or semi-arid developing countries. No final decisions have been made on which institutions will be involved at this time.

2. Remote Sensing

Currently a number of developing country institutions are cooperating with the Environmental Research Institute of Michigan on experimental uses of earth resources satellite (ERTS) imagery in solving development problems. These are:

Jahangirnagar University
Dacca, Bangladesh

Geological Survey, La Paz, Bolivia

Institute for the Investigation of Natural Resources
Santiago, Chile

Department of Mines and Geology
Maseru, Lesotho

Space and Atmospheric Research Center
Karachi, Pakistan

National Research Council
Bangkok, Thailand

In addition, representatives from resource and planning agencies from the following developing countries have participated in 2-4 week workshops on practical uses of satellite imagery:

Afghanistan	Malagasy
Botswana	Malawi
Brazil	Mali
Burma	Mauritania
Chile	Niger
China; Republic of	Nigeria
Colombia	Pakistan
Costa Rica	Panama
Dominican Republic	Peru
Ecuador	Philippines
Ethiopia	Senegal
Gambia	Swaziland
Ghana	Tanzania
Indonesia	Thailand
Kenya	Tunisia
Khmer Republic	Turkey
Korea	Upper Volta
Liberia	Vietnam

3. Remote Sensing Census Project

Institutional linkages for this project are:

Afghan Cartographic Institute
Kabul, Afghanistan

Central Bureau of Statistics
Nairobi, Kenya

Ministry of Finance
Ministry of National Defense
Ministry of Mines and Metallurgy
Ministry of Planning and Coordination
La Paz, Bolivia

4. Geobotanical Remote Sensing

This project is being conducted in cooperation with national bureaus of mines and geology in Thailand, the Philippines, and Brazil.

5. Environmental Training

Countries participating in the University of North Carolina environmental training program are:

Brazil	Jordan
Chile	Turkey
Dominican Republic	Indonesia
Guatemala	Khmer Republic
Paraguay	Korea
Peru	Laos
Ghana	Philippines
Kenya	Thailand
Tunisia	Vietnam

6. Environmental Economics

The contractor is carrying out data gathering and guidebook review in cooperation with a number of international and regional organizations, including ICAITI, PAHO, UNIDO, ECA, IBRD, OECD, UNEP, and UNITAR, and with developing country institutions, including the Institute of Economic and Social Planning in Brazil and the National Council of Science and Technology in Mexico. Other developing country institutions will cooperate in the study as it progresses.

7. Use of Secondary Woods

Philippines Forest Products and Industrial Development Commission. Other countries and institutions will be cooperating in the implementation of this research project but have not been identified at this time.

C. Reducing Public Investment Costs

1. Low-Cost, Typhoon Resistant Structures

University of the Philippines

Philippine Atmospheric Geophysical and Astronomical Services Administration

Philippine National Housing Corporation

Philippine Land and Housing Development Corporation

Peoples Homesite and Housing Corporation, Philippines

Government Service Insurance System, Philippines

Philippine Social Security System

Philippine Standards Association

Philippine National Building Code Committee

Association of Structural Engineers of the Philippines

Philippine Bureau of Public Works

Philippine Civil Aeronautics Administration

Philippine National Science Development Board

2. Low-Cost Roofing

National Council for Scientific Research
Lusaka, Zambia

Ministry of Housing
Kingston, Jamaica

National Economic and Development Authority (tentative)
Manila, Philippines

University of the Philippines (tentative)
Quezon City, Philippines

3. Sulphur Bonding

Instituto Credito Territorial
Bogota, Colombia

Fondo Colombiano de Investigaciones Cientificas
(COLCIENCIAS), Bogota, Colombia

4. Transportation Planning

Ethiopian Highway Authority
Addis Ababa, Ethiopia