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U.S. BACKGROUND PREPARATIONS AND POLICY FORMULATION FOR THE UNITED NATIONS CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

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OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
NINETY-SIXTH CONGRESS

FIRST SESSION

BY THE

SCIENCE POLICY RESEARCH DIVISION
CONGRESSIONAL RESEARCH SERVICE
LIBRARY OF CONGRESS

Serial Q

AUGUST 1979

Printed for the use of the Committee on Science and Technology

U.S. GOVERNMENT PRINTING OFFICE
49-251 O WASHINGTON : 1979

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LETTER OF SUBMITTAL

July 24, 1979

Honorable George E. Brown, Jr.
Chairman, Subcommittee on Science Research
and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

We are submitting a report your staff requested to provide the Subcommittee with background information for hearings dealing with U.S. preparations for the U.N. Conference on Science and Technology for Development. It is also intended to be of use to members of the congressional delegation to the Conference, since it summarizes the history of preparatory activity. It also outlines policy positions of the U.S. Government and the other nations participating in the Conference. Much of the material draws upon documents current through June of 1979. However, the discussion of major Conference issues is current through the fifth Preparatory Committee meeting, which ended on July 6, 1979.

The study also includes summaries of some of the major recommendations found in policy reports prepared for the State Department by scientists, developmental specialists, and members of the private sector--especially industry and labor--regarding views the United States should take at the Vienna meeting.

Most of the report was prepared by Genevieve J. Knezo, Specialist in Science and Technology, Science Policy Research Division. Wendy H. Schacht, Analyst in Science and Technology, Science Policy Research Division, prepared the section describing how the executive branch is dealing with "appropriate technology" in preparing for the Conference. Lois B. McHugh, Analyst in the Foreign Affairs and National Defense Division, made critical comments and provided some information dealing with the politics of the United Nations in preparing for the Conference and the views of "third world" nations.

This report was reviewed by Walter A. Hahn, Senior Specialist in Science, Technology, and Futures Research.

The final copy was produced by Jeannette E. Porter, Assistant Division Secretary, Science Policy Research Division.

We hope this material will be of use to you. Please let us know if we can provide additional assistance.

Sincerely yours,

Gilbert Gude
Director

Enclosure

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U.S. BACKGROUND PREPARATIONS AND POLICY FORMULATION FOR THE UNITED NATIONS CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Coordinated by
Genevieve J. Knezo
Specialist in Science and Technology
Science Policy Research Division
July 16, 1979

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Washington, D.C. 20540

I. INTRODUCTION AND SUMMARY

The United Nations Conference on Science and Technology for Development (UNCSTD), to be held in Vienna, August 20-31, 1979, originated from demands first enunciated in 1974 by the "Group of 77" less-developed countries (LDCs), which now number more than 120, for establishment of a New International Economic Order (NIEO). The basic objective of the NIEO, in the words of the U.N. are to debate "...ways and means of redressing economic inequalities between developed and developing countries .... [especially that] developmental thinking [which] calls for a revision in the existing system of global rules and practices." The "...establishment of a new international scientific and technological order," is a fundamental part of the search for remedies for this current imbalance. 1/

The UNCSTD meeting is the latest in a series of world conferences on global problems and quality of life initiated by the U.N. since 1972 dealing with such issues as the human environment, food, population, human settlements, water, desertification, and the role of women. Forthcoming U.N. meetings of this same type include a meeting on the next development decade, planned for 1980, and a world conference on renewable and alternative energy sources, scheduled for 1981.

1/ United Nations Conference on Science and Technology for Development. Preparing for Vienna, 1979. Issued by the United Nations Conference on Science and Technology for Development, by the Centre for Economic and Social Information, May 1978.

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A. EMPHASIS ON ACHIEVING A "NEW INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL ORDER," AS PART OF NIEO

Contrary to the views widely prevalent among many scientists and officials of the developed world, the conference is intended by its U.N. planners to be a political and governmental debate of governmental decisionmakers of Ministerial Rank, and not primarily a scientific conference of scientists and technologists. Joao Frank da Costa, of Brazil, Secretary-General of the UNCSTD, underscored this thinking in a recent article in the Bulletin of Atomic Scientists:

> Two main features of the Conference do not seem to be fully endorsed in scientific circles: that it is a governmental and intergovernmental exercise, and that the substance of science and technology is not going to be discussed. 1/

The U.N. is careful to point out that this conference will be be extremely different from its predecessor, the U.N. Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, held in Geneva in 1963, and generally considered to have been a failure because it was dominated by diplomats from developed countries and scientists without practical grasp of development. "That was essentially a scientific conference, which resulted in a useful exchange of scientific and technological information," according to the U.N., but without, however, establishing a direct link between this information and the development process." 2/

1/ Joao Frank da Costa. Instuments for Development. Bulletin of the Atomic Scientists, Oct. 1978: 56.

2/ United Nations Conference on Science and Technology for Development, Preparing for Vienna, 1979, op. cit.

The UNCSTD in contrast is predicated on the notion that science and technology contribute beneficially to economic growth, that LDCs do not share equitably in the distribution of the world's storehouse of scientific and technical knowledge, and that the application of S and T require conscious political decisions at both the national and the international levels. 1/ Thus, U.N. press releases say "UNCSTD will deal mainly with the identification and removal of obstacles to the application of science and technology to development, be they social, political, economic, institutional or cultural" 2/

Secretary-General da Costa is more specific:

> The real issue of the forthcoming Conference is precisely to couple from the very beginning the political will of governments with the scientific and technological instruments for development and to overcome obstacles, that, until now, have hampered a significant utilization of science and technology. . . .
>
> . . .[S]cientists ...sometimes find it difficult to accept that the actual application of knowledge to the problems of society depends on a decisionmaking process normally situated at the governmental level. Desirable or not, nowadays the State is the only entity having the capacity and the necessary integrated approach to take responsiblity for the well-being of society.
>
> Obstacles to the application of science and technology to development are not generally scientific and technological, but of a political, social, institutional, cultural or psychological nature. Technological choices cannot be taken on the basis of scientific knowledge alone; even a comprehensive, overall and independent national science policy does not permit the making of the necessary choices. The strategic choices between great options are generally guided by non-scientific criteria, in opposition to the tactical treatment of problems within

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1/ da Costa, op. cit., pp. 56-57.

2/ United Nations Conference on Science and Technology for Development, Preparing for Vienna, 1979, op. cit.

the chosen areas, which depend to a large extent on scientific criteria. 1/

Many scientists and technologists, both those sympathetic to the demands of the NIEO and those with a more circumspect view, object to the lack of attention that will be given to specific scientific and technological applications at UNCSTD. Their views coincide with those of the least-developed of the developing countries, who share many scientists' emphasis on basic human needs. Several national and international scientific groups have held conferences and prepared research reports on behalf of UNCSTD. In order to satisfy their demands for more representation, the U.N. has arranged for scientists to meet in Vienna but in separate forums. A scientific meeting, organized by the U.S. Advisory Committee on the Application of Science and Technology to Development will meet in Vienna the week before the Conference. It is expected to address actions that developed nations and scientists themselves can take to design cooperative projects to promote development. Another meeting will be held concurrently with the conference: the Nongovernmental forum, expected to be attended by more radical scientists, critics, and observers. It is being held consonant with U.N. procedures to allow nongovernmental meetings concurrent with world conferences, to critique official proceedings and serve a safety-valve function.

Although officials of both developed and less-developed countries alike agree that socio-economic-cultural factors hamper the application

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1/ da Costa, op. cit.: 57.

of science and technology, they disagree considerably on what these factors are and how to overcome them. This difference of opinions has prevented participating countries from reaching agreement on a precise conference agenda. For example, the UNCSTD agenda will examine four official goals:

- the role of science and technology in development, including the removal of obstacles to their better utilization, especially in the developing countries;

- suitable institutional arrangements and possible new forms of international cooperation in the application of science and technology;

- ways and means of making better use of the U.N. system; and

- science and technology and the future.

Since U.N. planners decided that the success of UNCSTD depends on the preparatory efforts that go into it, participating nations have been asked to prepare national papers suggesting precise action items for these four goals. The U.N. required that each country inventory its progress in science and technology and the actions it would take to aid the developing countries. Papers have also been required of regional/political groups within the U.N. system. These papers have served as part of the data base which the U.N. Secretariat has used to prepare successive draft programs of action or agendas for the conference. The programs of action have been developed and refined during an iterative process, following discussion at five pre-conference meetings, called "prepcoms," held by the U.N. to firm up a conference agenda and to permit all nations to negotiate differences before the August meeting.

Many governmental and nongovernmental persons connected with the conference believe that the preparatory period itself will be more important than the actual conference in Vienna, since all countries are compelled to examine their S and T experiences, needs, and potential for cooperation. The preparatory period, they say, also affords non-governmental organizations and scientific groups an opportunity to determine steps they could take to aid in the application of S and T for development.

But the preparatory period has also served to underscore the dramatic differences that remain between both the developed and developing world and even among some members of the developing nations as they suggest solutions for overcoming obstacles to applying science and technology to development.

The developed countries have not expressed much enthusiasm for the concepts of the New International Economic Order. This is not surprising considering the virulent rhetoric that has accompanied some NIEO demands and the substantive rejection of traditional patterns of international trade, ownership of property, and MNC activities embodied in these demands. U.N. statements stress:

> A principal means of applying science and technology ...has been to evolve technologies in developed countries and transfer them to developing countries in the expectation that this would prove the most effective way of accelerating development. However, such technology transfer ... has often created more problems than it has solved. It has resulted ...in the degradation of endogenous cultural and social heritage of developing countries.... 1/

1/ Guy Gresford. UNCSTD and Global Interdependence. New Scientist, Mar. 8, 1979: 787. (Mr. Gresford is Deputry Secretary-General of UNCSTD.)

At present, the developed world has a virtual monopoly of the technical application of science. This imbalance is all the more striking when respective levels of research, technological and institutional capacity in developed and developing countries are compared. For example, estimates show that more than nine tenths of current scientfic research is being carried out in the developed world -- much of this for defence purposes or to preserve market positions.

The resulting disparity in living standards is of concern to all nations, for if it is not remedied, by the year 2050 it is estimated that some 4 per cent of the world's population will live in developed countries as compared with today's 20 percent -- an untenable situation now, and potentially explosive. 1/

. . . The only way to accelerate the genuine development of developing countries is to increase their productive capacity. For this to occur, the strengthening of endogenous scientific and technological capabilities is a sine qua non. In turn, this requires substantial changes in the international process of decision making, the generation and development of technologies, research, and the technological system also has to be restructured to ensure that the global resources of science and technology are optimally applied. 2/

Pessimistically, UNCSTD Secretary General da Costa views UNCSTD as perhaps "...the last realistic attempt to achieve amicable and acceptable international relations." If NIEO demands are not met at UNCSTD, he forsees " . . . a new wave of distrust and disruption between developed and developing countries, in which everyone is bound to lose and obviously the haves even more than the have nots. Attempts to retain the monopoly of science and technology in the developed nations must result in a politically explosive situation and a threat to world peace." 3/

1/ United Nations Conference on Science and Technology for Development, Preparing for Vienna 1979, op. cit.

2/ Gresford, op. cit.

3/ da Costa, op. cit., p. 57.

B. DIFFERENCES BETWEEN THE UNITED STATES AND THE GROUP OF 77

During the five "prepcoms" that have been held, an attempt has been made to reach consensus on a draft program of action, which contains over 200 demands proposed by the Group of 77, which dominates the UNCSTD preparations. These are arranged into three basic areas dealing with: infrastructure growth, revising international arrangements for operations of technology firms and for technology transfer, and creating a new U.N. agency to govern international science and technology and to create a new international fund for development endowed annually by developed nations, at the level of $2-4 billion per year.

The differences between the developing countries and the United States are exemplified by the areas of convergence and of significant divergence illustrated at the last "prepcom" which ended July 6, 1979. In summary, the United States and the developing countries more or less agree that action needs to be taken in the following areas

- Strengthening LDC S and T capabilities by strengthening human resources and institutions, taking steps to develop infrastructure and integrate dualistic economies, and developing programs for education and training,

- Conducting more R and D on critical problems specific to the LDCs, especially to conduct projects in the LDCs,

- Strengthening S and T information systems and linkages between them (but without permitting access to proprietary technical information, an LDC demand), and

- Strengthening U.N. regional S and T activities.

Developing countries and the United States disagree, however, on many of the precise steps that should be taken to achieve these four goals.

The United States and the developing countries disagree significantly on how to satisfy the major Group of 77 demands. Thus the major areas of difference are:

- Transfer of proprietary technology and conduct of transnational corporations: The U.S. objects to legally binding codes of technology transfer, and "unpackaging" of technology so that LDCs would have access to intra-firm information about the costs of production. The U.S. does not want these issues discussed in UNCSTD, saying they are already being treated adequately in other U.N. forums;

- A greatly enlarged government role in the area of science and technology for development: Many LDCs feel technology is a "free right" of all men, but is now autonomously controlled by elite MNCs;

- Comprehensive restructuring of the U.N. system for science and technology for development: The U.S. objects to LDC proposals to create a new U.N. body to govern U.N. science and technology activities and to guide a new international scientific and technological information system;

- Development of an international development fund for science and technology within the U.N. funded by contributions assessed upon the developed countries based on the imbalance in trade of manufactured products between the LDCs and the developed nation. The fund would receive contributions totalling $2 billion to $4 billion annually.

C. DO U.S. POLICYMAKERS APPRECIATE THE STRENGTH OF LDC PERCEPTIONS AT UNCSTD?

It is generally acknowledged that U.S. preparatory activities for the conference have been the most extensive of any country (the total U.S. cost for fiscal years 1978 and 1979 is $3.5 million). But the United States seems to be taking a reactive role in responding to LDC demands --- hoping that demands will moderate as Conference preparations proceed. Some critics have faulted this tactic and the apparent inability of the United States to make concrete initiatives responsive to developing country demands. For instance,

Mr. William Carey, executive director of AAAS, and expected to be a member of the national delegation to UNCSTD, reported in joint hearings held on July 16, 1979, before the House Committee on Science and Technology and the Senate Committee on Commerce, Science and Transportation, that the Department of State has not yet prepared adequate responses to major Group of 77 demands, despite the UNCSTD being only one month away:

> As of now, the delegation has no brief to report U.S. readiness to scale up research and development on problems of developing countries over the next decade, nor to participate in a new common fund for research and development, nor to facilitate negotiation of new terms for the transfer of proprietary technology, nor to expand the availability and services of public technology such as the earth resources satellite, nor to help create and support a workable science information system to guide development. 1/

The basic criticism levied against U.S. policy for UNCSTD is that American decisionmakers do not appreciate the strength of conviction and perceptions behind the demands embodied in the calls for a New International Economic Order. Many of the developing countries convey the desire to rid themselves of the economic domination imposed by the Western industrialized countries, which in the past exploited their human and natural resources while promoting their own development. The Group of 77 nations who make these demands say that only sweeping international institutional and structural reforms can redress the imbalance between the world's industrial-

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1/ Testimony of William D. Carey, Executive Officer, American Association for the Advancement of Science, July 17, 1979: 2.

ized democracies and those nations on the periphery of an industrial economy. The most advanced of the developing countries have declared that they want 25% of the world's manufacturing capability to be in their hands by the year 2000. Also they want to be conducting 20% of the R and D that is carried out in the world by the year 2000. It is estimated that world industrial growth would have to expand at the rate of 11% annually to permit developing countries to achieve these goals through market forces. Since such a rate of growth is impossible, unguided market forces alone will not permit developing countries to achieve their goals. 1/ As a result, they call for greater mandated control of the world's existing technological and manufacturing capability.

These nations also call for greatly accelerated programs of international financial assistance, preferential trade concessions, and S and T development funding mechanisms. Also, the United Nations has requested that all industrialized nations contribute at a minimum 0.7 percent of their GNP to foreign aid programs for the developing countries. The United States's rate ranks 13th among all industrialized nations, or about 0.25 percent of GNP.

1/ Charles Horner. Redistributing Technology. Commentary. v. 67, Jan. 1979: 2.

Developing countries also say they believe that controlling science and technology is an integral part of the New International Economic Order. They perceive that science and technology have escaped from social control in both the industrialized and the third world countries and are controlled by the autonomous decisionmaking authority of multinational corporations and are not subject to the control of either local political leaders or members of society concerned with assessing the societal, economic, and ecological implications of new technologies.

Many of the most developed of the LDCs --- those with considerable industrial development and multinational corporation activity --- therefore, call for changes in international trade and technology transactions and procedures. They seek legally binding codes of conduct for technology transfer, free or cheap access to proprietary industrial information, and creation of large international development assistance funding mechanisms with developed country contributions to be based on the size of imbalances in trade of manufactured goods between the LDC and the developed country.

Developed nations, of course, disagree with these demands. The United States says that international trade and technology issues or issues relating to a restructuring of the international monetary system are being discussed in other forums, such as the U.N. Conference on Trade and Development (UNCTAD), the Multilateral Trade Negotiations, in negotiations dealing with the General Agreement on Tariffs and Trade (GATT), in deliberations of the U.N. Commission on Trans-

national Corporations, and in the World Industrial Property Organization (WIPO) for the Paris Convention on Industrial Rights.

Developed countries do not want these items placed on the agenda of UNCSTD for fear that the meeting will be stalemated in a confrontation of ideological issues being discussed elsewhere, while more substantive issues remain undiscussed. Some developed nations however, including the United States, go so far as to propose modest increases in aid budgets and creation of new national institutions to assist in developing solutions for applying S and T to development in specific functional areas. The United States proposal is called the Institute for Scientific and Technological Cooperation (ISTC). The bill to create ISTC is awaiting conference committee action. (For an explanation of House and Senate differences, see section VII. 4.)

The United States and most developed nations seem to view the demands for a New International Economic Order in lower case letters as a "new international economic order" -- an evolutionary process that will lead toward a gradual improvement of levels of economic growth in the developing countries. But this is to be caused not by international institutional reforms, massive governmental intervention and technology supply mechanisms which the LDCs insist upon, but by a dependence on modestly influenced market forces and indigenous structural changes.

Developing nations reject the assumption that a continuation of free market economics of the past will promote the development that it has not promoted in the past. Thus, while developing countries

call for measures to redistribute the world's wealth, resources, and productive capacity, the industrialized democracies emphasize increased production by all countries, for the benefit of all. The U.S. position was summarized by Dr. Frank Press in remarks made on UNCSTD in 1978, when he stressed the benefits of U.S. technology transfer flows to developing countries because of the potential growth of new markets:

> Not only are many of the developing countries current potential sources of natural resources essential to the continued growth of the industrialized world, they are the future markets of that world. They are also the future producers of many of the world's manufactured products. A preview of all this can already be seen in today's trade between the United States and the developing world. As a recent State Department paper has pointed out, that trade is far more important than most Americans realize. Of the $120.2 billion of goods the U.S. exported in 1977, more than $40 billion -- about 35 percent -- went to developing countries. That was more than our sales to Western Europe and Japan combined. At the same time we imported $67 billion from developing countries, about 46 percent of our total purchases. Approximately 1,200,000 American jobs are directly dependent on such exports, with many more indirectly involved. . . . There is a "new economic order" evolving -- a new global interdependence that must be recognized and dealt with constructively by all nations. 1/

Developed nations and some of the least developed of the developing countries (i.e., the "fourth world") focus especially on the need to effect structural changes to remove domestic obstacles to development. This includes integrating dual economies or societies, developing indigenous S and T capability, and creating sufficient

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1/ Proposed remarks by Dr. Frank Press, Director, Office of Science and Technology Policy and Science and Technology Adivsor to the President at the UNA/USA Mid-Atlantic Regional Leadership Conference. Washington, Sept. 8, 1978: 1-2.

infrastructure to permit adoption and adaptation of technology.

There seems to be agreement among these nations also about the need to stress appropriate technology as a solution to development. Many of the more developed of the developing countries, however, oppose appropriate technology on the grounds that such an emphasis will force LDCs to remain undeveloped since they do not have enough trained scientists and engineers to devote time to developing both appropriate and more advanced technological knowledge.

A crucial element of most developed countries positions thus far, and one that is reflected also in the demands of the poorest nations, is the need to take a sectoral approach to applying S and T to development. This means using the UNCSTD Conference discussions to consider unilateral, bilateral, and multilateral actions needed to overcome such specific problems facing the developing countries as health, energy shortages, and training manpower. However, Department of State officials have not yet formulated programs in these areas for presentation at UNCSTD. Perhaps they have felt constrained in offering specific substantive proposals since the Congress and the President have recently evidenced considerable fiscal austerity and budget tightening whenever new policy initiatives are discussed.

For instance during the July 17 hearing on UNCSTD, Mr. William Carey commented:

> Putting on my...hat as a U.S. delegate to the Vienna Conference, I must say that we will be traveling light so far as U.S. initiatives go. The posture of our delegation is unavoidably shaped by the current mind set of the Administration and the Congress towards new directions in either domestic or international policies. The strong preference for restraint, retrenchment, and national self-interest is

> unmistakable and grounded solidly in public opinion. Faced with inflation, recession, energy shortages, and rising uncertainty as to the sustainability of the U.S. growth economy, public policy tilts decisively towards a defensive orientation. As a result, the approach we bring to Vienna and to the promotion of development through sharing U.S. science and technology is built very close to the ground. 1/

Congressional opposition to assessed funding for U.N. technical assistance projects is also a critical element confronting policymakers.

D. OTHER DILEMMAS CONFRONTING POLICYMAKERS

Some Americans, as well as developing country critics, say the United States will not be able to deal with the demands of the UNCSTD since this nation has no comprehensive economic or scientific and technological policy to propose to the developing nations. 2/ Ambassador Wilkowski, for instance, noted that in support of the Conference:

> The Department of State is leading a review of our development and technical assistance strategies and programs which make up the effective body of an undeclared policy on science and technology cooperation with developing countries. This policy has never been declared in any formal statement. But one is being prepared for this conference. 3/

1/ Carey, op. cit.: 1-2.

2/ Anne Roark. UN Conference: Scientists Feel Cheerier. Science and Government Report, Jan. 15, 1979: 6; Anne Roark. U.S. in Cautious Stance on R and D and Foreign Aid. Science and Government Report, Feb. 15, 1979: 1-2.

3/ Remarks of Ambassador Jean Wilkowski, U.S. Coordinator for the United Nations Conference on Science and Technology for Development at the Washington Leadership Conference, Sponsored by the United Nations Association in Washington, D.C., Sept. 8, 1978: 5.

The developing countries claim that the absence of such a policy -- and its implications for developmental assistance -- makes it impossible for U.S. policymakers to realize that the developing countries want to focus on process issues -- institutions, aid structures, revising legal codes -- before they deal on a piecemeal basis with bilateral S and T cooperative programs. A Presidential Review Memorandum on science and technology for development has been in preparation for two years, but has not yet been completed. Also U.S. attempts to press for discussion of substantive issues are stalemated by the absence of coherent policies or mandates in most Federal agencies for the conduct of development or S and T related activities abroad. Many of these activities were inventoried for the Coordinator's Office.

Another factor characterizes the dilemmas surrounding U.S. preparation for UNCSTD. That is the lack of homogeneity in demands made by the developing countries. Publicly the Group of 77 maintains a united front. But privately its members disagree considerably about the contents of the draft program of action being promulgated by the radical element of the Group of 77, the Latin American caucus. The more advanced nations, Brazil and Mexico, tend to focus on technology transfer and industrialization in an effort to win concessions from multinational firms (MNCs), with which they have considerable dealings. Lower income countries, such as Haiti, Honduras, and some of the African countries have tended to focus on satisfying basic human needs. The difficulty is in designing policies which approach both types of demands.

As part of its preparations for participation in the conference, the United State Government has been seeking to determine what public and private sector science and technology programs and policies can be used to help alleviate development problems. The Department of State established a Conference Coordinator's Office, headed by Ambassador Jean Wilkowski. Father Theodore Hesburgh, the President of Notre Dame will head the U.S. delegation to the meeting. The Coordinator's Office has used the results of a series of meetings with concerned publics -- labor, industry, scientists, academics -- and of special research projects and intergency working groups to develop initial U.S. recommendations for the Conference. Preliminary U.S. Government recommendations were enunciated in the U.S. national paper, published in January 1979. Final U.S. policy papers are expected to be completed by July 20, for use and study by the official national delegation and the congressional delegation at the Conference. Nongovernmental interest groups and groups of national and international scientific associations have also been meeting and preparing position papers to be used at the Conference.

Some observers note that UNCSTD probably will not accomplish much in the way of creating new institutions or revising codes of technology transfer. Although ideological confrontations seem likely, the UNCSTD's major legacy may be to draw attention to the problems of development that science and technology might alleviate, and to set in motion nongovernmental collaborative efforts to solve them. The numerous studies and inventories conducted then, both by governments and by scientists are a useful step to accelera-

ting the process of using science and technology for development.

This report discusses the origin and evolution of Conference preparations, describes and analyzes some of the difficulties U.S. policymakers have encountered in developing acceptable U.S. policy for the meeting, looks at the roles played by major Federal agencies, documents conferences held to help define a U.S. position, looks at the role of the Congress, describes the participation of nongovernmental groups especially the scientific community, and identifies issues which the United States is expected to confront at the conference.

II. INTERNATIONAL EVENTS LEADING TO THE ANNOUNCEMENT OF UNCSTD

A. LEGACY OF THE 1963 U.N. CONFERENCE ON THE APPLICATION OF SCIENCE AND TECHNOLOGY FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

The first major U.N. conference on science, technology and development was held in 1963 --- the U.N. Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas. It is almost universally considered to have been a failure, since, as reported in a House Foreign Affairs Committee study ". . . it remained rather academic; there was little attention to action-oriented decisions and programs. The Conference did not foresee some of the major problems of technology which would soon emerge as major issues. . . .," 1/ and the increased awareness of the links between science and development made at the meeting were not translated into practical action. It is also generally acknowledged that the meeting was dominated by diplomats of the developed world not ready to recognize the magnitude of demands that would be made by less developed nations to share in the benefits of industrialization.

B. U.N. SCIENCE AND TECHNOLOGY ACTIVITIES: 1964-1974

U.N. science and technology activities during the period 1964 to 1974 were summarized in the House Foreign Affairs document. 2/

1/ U.S. Congress. House. Committee on Foreign Affairs. United Nations Conference on Science and Technology for Development -- a Background Paper. Prepared by the Congressional Research Service, Library of Congress. 96th Congress, 1st session. Washington, U.S. Govt. Print. Off., Feb. 12, 1979, p. 6. Coordinated by Vita Bite.

2/ The next few paragraphs are based on the study cited above, pp. 6-10.

As a follow-up to the Conference, the Economic and Social Council in 1964 created the U.N. Advisory Committee on the Application of Science and Technology to Development (ACAST). The Committee, composed of 24 expert members was charged with trying to promote greater utilization of science and technology in U.N. programs.

ACAST's major activity was to prepare a World Plan of Action for the Application of Science and Techology to Development, which was published in 1971. Several regional plans were also completed. The Plans have stressed that developing countries should not rely on technology transfers to promote development, but should strengthen indigenous science and technology capabilities. The basic plan identified 13 priority areas in which the acquisition of new knowledge by basic and applied research would seem to have particular application to development, such as in desalination, health, natural disaster warning systems and materials research. But, apparently ". . . little has been done to implement the measures outlined in the World Plan," because ACAST has no resources for its implementation.

As the first U.N. Development Decade of the 1960s was ending, the General Assembly asked the U.N. Secretary-General to report on the ways science and technology could be applied to development. In his report the Secretary-General urged that an international conclave address ways of generating the political will and action needed to apply science and technology.

Concurrently, in 1971, the Economic and Social Council established an Intergovernmental Committee on Science and Technology for

Development (CSTD) composed of political delegates to overcome the shortcomings of the ACAST.

C. ISSUANCE OF THE MANILA DECLARATION ON THE ESTABLISHMENT OF A NEW INTERNATIONAL ECONOMIC ORDER

Before the Committee acted, the Group of 77 less-developed countries promulgated its demands for the U.N. to take up the subject of applying science and technology to development. On May 1, 1974, at the Sixth Special Session of the U.N. General Assembly, the group issued a document which has come to dominate most development action in the 1970s -- the "Declaration and Program of Action on the Establishment of a New Economic Order." Included in the declaration were such demands as establishing a legally binding code of technology transfer intended to give LDCs more control over the factors and costs of technological production, restructuring of ownership of international technology, and establishment of international industrial technology information banks. The declaration also specified that many of these issues be taken up in a forthcoming U.N. Conference. The NIEO declaration was reaffirmed in Manila in 1976, prior to the UNCTAD IV meeting.

D. SLOW BEGINNING OF RECOGNITION OF NIEO DEMANDS BY THE DEVELOPED COUNTRIES

Initially the demands set forth in the NIEO declaration received little attention in the developed countries. But, in the period following the Arab oil boycott in the fall of 1974, the developed countries began to reconsider their response to the demands of the NIEO.

This changing response was noticeable at several U.N. bodies during 1975. During that year the U.N. Economic and Social Council (ECOSOC), established an intergovernmental working group of CSTD to plan an agenda for a proposed UNCSTD. The Seventh Special Session of the General Assembly in 1975 adopted a resolution recommending that such a conference be held. This was Paragraph 7 of Section III of Resolution 3362 on International Development and International Cooperation. Subsequently the General Assembly adopted additional resolutions, setting the date for the Conference and outlining a Conference agenda.

Secretary of State Henry Kissinger announced official U.S. support of the Conference in his September 1 speech to the General Assembly -- an endorsement which initiated U.S. preparations for the Conference.

E. U.N. ANNOUNCEMENT OF UNCSTD CONFERENCE OBJECTIVES

The objectives of the conference, as recommended in ECOSOC and General Assembly resolutions adopted in 1976 were:

- to adopt concrete decisions on ways and means of applying science and technology in establishing a new international economic order, as a strategy aimed at economic and social development within a time frame;

- to strengthen the technological capacity of developing countries so as to enable them to apply science and technology to their own development;

- to adopt effective means for the utilization of scientific and technological potentials in the solution of problems of development of national, regional and global significance, especially for the benefit of developing countries,

- to provide instruments of co-operation to developing countries in the utilization of science and technology for solving socio-economic problems that cannot be solved by individual action in accordance with national priorities.

These resolutions also proposed the following issues of the application of science and technology to development as agenda items for the Conference: 1/

1. Science and technology for development:

   - the choice and transfer of technology for development,

   - elimination of obstacles to the better utilization of knowledge and capabilities in science and technology for the development of all countries, particularly for their use in developing countries,

   - methods of integrating science and technology in economic and social development, and

   - new science and technology for overcoming obstacles to development.

2. Institutional arrangements and new forms of international cooperation in the application of science and technology:

   - building up and expanding insitutional systems in developing countries for science and technology,

   - research and development in the industrialized countries in problems of importance to developing countries,

   - mechanisms for exchange of scientific and technological information and experiences significant to development,

   - strengthening of international cooperation among all countries and the design of new concrete forms of international cooperation in the fields of science and technology for development, and

   - promotion of cooperation among developing countries and developed countries,

3. Utilization of the existing United Nations system and other international organizations to achieve the goals outlined, and

4. Science and technology and the future.

1/ United Nations Conference on Science and Technology for Development -- Background Paper, op. cit., pp. 12 - 13.

F. OBJECTIVES AND SCOPE OF PREPARATORY ACTIVITIES REQUIRED BY THE U.N.

According to many conference planners the preparatory period for UNCSTD may well be more important than the conference itself because of the extensive two-year long period of national analysis, political coalition building and professional networking that planners hope will have occurred by the time of the August 1979 meeting. It was hoped that these interactions would serve two purposes: (1) to set in motion cooperative and consultative arrangements that would continue to act effectively to serve conference goals after UNCSTD ended, and (2) to serve the analysis and inventory procedures needed to develop and agenda for UNCSTD.

1. Requirements for National Papers

Early in planning for the conference, the U.N. adopted procedures which called upon agencies participating in the meeting -- national delegations, agencies of the United Nations, regional and sub-regional political groupings, and non-governmental organizations -- to inventory and assess issues to be discussed at UNCSTD.

Nation-states participating have been required to prepare "national review papers" whose objective, in the words of the U.N. was to analyze ". . . in light of its own experience, the relevant social and economic problems that may be solved with the help of science and technology." Preparation of the papers had several objectives. One was to assist in generating political consensus and commitment at national levels for actions to be taken at UNCSTD. A second was to force developed nations to inventory historical technology policies which might

profitably be transferred to developing countries, and to identify opportunities for expanding cooperation or aid to them. Another objective was to stimulate national debates among relevant groups within nations --- government officials, development specialists, scientists and technologists, industrialists, academics and community groups --- in the hopes of generating political will and consensus before the meeting. It was hoped that disparate groups of nations would be able to reach agreement on an UNCSTD agenda during the five preparatory meetings, or "prepcoms," held before the Vienna UNCSTD meeting.

2. Regional and Professional Meetings

Accompanying these national efforts have been a series of governmental and nongovernmental regional and international meetings intended to help inventory resources and opportunities for formulating policies and programs to aid in the application of science and technology to development. Among the international political/regional groups which have met and issued position papers are: all the U.N. regional economic commissions, such as the Economic Commissions for Europe, Latin America, East Asia and the Pacific, etc. Among the professional scientific and technological groups which have met are: the International Council of Scientific Unions, the Pugwash Group on Science and World Affairs, the American Association for the Advancement of Science, other national scientific associations, and groups focusing on industrial technology and appropriate technology. (For details on these activities see section X, below.)

3. Role of the Secretary-General and the Secretariat

The final agenda to be discussed at UNCSTD in Vienna in August 1979 is intended to be the result of an iterative process of pre-conference decisionmaking by the UNCSTD Preparatory Committee.

Throughout the preparatory period, the role of the Secretary-General has been to maintain the momentum of the period and to maintain the direction set by the Preparatory Committee and the General Assembly. Those countries which did not have the money or expertise to develop country programs were aided by experts from the Secretariat. The Secretariat also had a role in all the regional meetings. In addition to this directing and coordinating role, the Secretary-General was asked to submit a comprehensive and analytical progress report of the General Assembly, through the Economic and Social Council. 1/

Not all has gone according to schedule. Final drafts of the country papers were scheduled to be submitted to the Secretariat by August 1, 1978. But as of September 30, 1978, only 104 national papers had been submitted. Almost 50 papers had not been submitted, including the United States' paper. The regional plans of action were to be presented to the third meeting of the "prepcom." But as of the end of 1978, the Latin American regional paper had

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1/ UNCSTD. Meetings Contributing to the Preparation of the United Nations Conference on Science and technology for Development. New York, 1978. (A/CONF.81/INF.3) p. 2.

not been formally adopted by that region. The plans of action available were summarized by the Secretary-General of the Conference and published as a U.N. document in October 1978. The same month, the Secretary-General issued a draft plan of action which was based on the reports of regional meetings and national summaries and papers received by the Conference secretariat up to 28 August 1978. 1/ Because there was criticism of the organization and content of this draft plan of action, the Secretary-General was directed to revise it before the third meeting of the "prepcom."

There has been other criticism of the conference preparations, some of it centering on the role of Mr. da Costa himself. During the entire preparatory period, the Secretary-General has maintained that the momentum for the Conference must originate with the participants. Additionally he has maintained that the Plan of Action must be hammered out at the national and regional levels and only synthesized at the Secretariat level. For these "low profile" attitudes he has received both praise and criticism. Many of the developing countries have been especially critical of him since it is these countries who are most in need of the help and guidance of a strong secretariat to ensure their impact on a world plan of action. 2/

1/ U.N. Secretary-General, 1972,- (Waldheim). UNCSTD. Draft Outline of the Programme of Action. New York, 1978. (Document A/33/303). p. 3.

2/ Peter Colins. UNCSTD: a Ray of Hope Despite Delay in Planning. Nature, v. 274, August 17, 1978: 631.

G. DECISIONS ABOUT THE UNCSTD AGENDA AND DRAFT PROGRAM OF ACTION AS ADOPTED IN EARLY "PREPCOMS"

During the second preparatory meeting held from January 23 - February 3, 1978, the assembled nations selected five major subject areas and sub-topics as substantive issues to be discussed at the meeting:

- food and agriculture, including agricultural technology and techniques and their improvement, nutrition, fisheries, and food storage and processing;

- natural resources, including energy, renewable and non-renewable resources, conventional and non-conventional sources of energy, development and conservation, and management and utilization;

- health, human settlements and environment, including medicinal plants and pharmaceuticals, health services, housing, and social services and environment;

- transport and communications, and

- industrialization including the production of capital goods. 1/

The Third Preparatory meeting held in New York, January 22 to February 2, 1979, was devoted to discussing a draft plan of action prepared by the UNCSTD Secretariat. The draft program was based partially on the submissions in national papers and reports of regional meetings and partially on a report of science, technology and development activities of U.N. agencies prepared by the secretariat.

The draft program of action contained over 200 recommendations, dealing primarily with issues of institutional reform, international

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1/ United Nations Conference on Science and Technology for Development -- A Background Paper, op. cit., 13-14.

technology transfer and other "process" issues, grouped into six target areas:

- sharing of knowledge and experience by all members of the international community;

- increasing the capability for policy-making in science and technology in its framework of development planning;

- transfer of technology for the benefit of development;

- enhancing endogenous capabilities in a context of national self-reliance;

- promoting collective self-reliance through co-operation among developing countries; and

- strengthening the role of the United Nations in the field of science and technology co-operation. 1/

According to several reports of the third meeting, especially in the LUND letter, neither the developed countries nor the less-developed countries were pleased with the topical breakdown or indeed about the content of many of the recommendations. Discussions apparently were stalemated because the Group of 77 objected to the plan but was unprepared to offer an acceptable alternative. The Group of 77 apparently felt the topical arrangement and recommendations was not in its best interest since recommendations were too general and diffuse to support the goals of restructuring the international scientific and technological and economic order. The developed countries objected to the emphasis on issues of international institutional reform and the lack of emphasis on substantive

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1/ United Nations Conference on Science and technology for Development, Preliminary Draft Programme of Action. Note by the Secretary-General of the conference. Jan. 10, 1979. A/CONF .81/PC.21.

applications of science and technology. However, apparently by the end of the meeting, consensus was reached (at least among the Group of 77) that the proposed program of action would be reorganized into 3 target areas instead of the six the secretariat had chosen. 1/

The arrangement adopted reflects a far more radical philosophy than the six category arrangement. The three new topics were:

- strengthening the scientific and technological capabilities of developing countries,
- restructuring the existing pattern of international scientific and technological cooperation, and
- strengthening the role of the United Nations in the field of science and technology and the provisions of increased financial resources. 2/

The recommendations contained in these categories served as the basis for discussion during the fourth "prepcom," held from April 23 to May 4, 1979, and the fifth "prepcom," held from June 25 to July 6, 1979, both in New York City. The draft program of action reported by these meetings contains many major areas of disagreement between developed and developing countries in critical issues of politics and economics. The few areas in which convergence was reached are on relatively non-controversial issues. The draft program of action reported by the fifth "prepcom" will be the focus of attention at Vienna.

1/ Latest News. Prep Comm. Meeting -- special Report. The Lund Letter of Science, Technology and Basic Human Needs. Feb. 1979. No. 10: 8.

2/ Preliminary Draft Program of Action (Rearranged as required by the Preparatory Committee in resolution 6 III)). Note by the Secretary-General of the Conference. Mar. 9, 1979. A/CONF.81/PC.28.

III. DEMANDS WHICH THE LESS-DEVELOPED COUNTRIES HOPE UNCSTD WILL MEET TOGETHER WITH AN OVERVIEW OF DIFFERENCES BETWEEN THE GROUP OF 77 AND THE UNITED STATES

A. INTRODUCTION TO DEMANDS OF THE GROUP OF 77

The Group of 77's domination of the U.N. General Assembly evidenced in the last few years (which can be attributed to the growth in numbers resulting from post-war decolonization) is mirrored in the group's domination of the preparations for UNCSTD. While the developing countries are not a monolithic group, they generally differ radically from the developed nations in defining obstacles to the application of science and technology to development. (See section XII.)

An example will serve to illustrate the conceptual, political, and economic dilemmas which will confront U.S. policymakers at UNCSTD.

One of the cornerstones of American policy for the UNCSTD is the promotion of programs to satisfy basic human needs, that is using science and technology at a minimum to feed, clothe, house, and promote the good health of the world's impoverished masses. Another basic facet of U.S. policy is to promote growth of indigenous institutional resources to create and maintain the knowledge needed to generate economic advancement and the growth of science and technology. 1/

1/ U.S. Department of State. Science and Technology for Development. United Nations Conference 1979. U.S. National paper. Washington, U.S. Govt. Print. Off. 1979. (Dept. of State Publication 8966.) p. 27.

Many of the developing countries object to this approach. They say that while meeting such goals is a responsibility of developing nations, the goals are inappropriate agenda items for UNCSTD. UNCSTD instead should focus on establishing the processes, procedures, international science and technology governing institutions, and the massive development funds required to give developing countries a capability to industrialize, to determine priorities for application of science and technology to development, to control the activities of MNCs, to gain free access to technical knowledge, and to create procedures whereby developing countries control the production cycles of MNCs operating within their borders.

For instance, during a meeting of the Conference of Foreign Ministers of the Non-Aligned Countries, convened in Belgrade during July 1978, the ministers denounced the basic human needs approach to development at the international level, declaring that it

> "would inevitably imply the imposition of global priorities on developing countries, thereby not only distorting the allocation of domestic resources of the latter, but also perpetuating their technological dependence on the developed countries." 1/

1/ Non-aligned Foreign Ministers Decide to Hold Pre-UNCSTD Meeting, Take Position on Basic Needs. Update, Issued by the Centre for Economic and Social Information, Conference on Science and Technology for Development, 1978, No. 8: 2.

The official U.N. periodical dealing with UNCSTD, a newsletter called Update, continued by attributing this view to most LDC officials:

> the spirit of this declaration is consistent with a view commonly held by many representatives of developing nations, who tend to see a preoccupation with the concept of basic needs on the part of developed countries not only as an attempt to exclude them from the global process of industrialization and economic growth, but also as an unjustified alternative to, and not a part of, the New International Economic Order. 1/

The Group of 77's proposed draft program of action, at a minimum, can be characterized as a radical statement. The attitudes reflected in the Group's preamble to the document, as presented during the fourth "prepcom," define the current impasse between developed and less developed countries. The Group of 77, for example, stressed that when based on population, the developing countries do not share equitably in the benefits of science and technology:

> The developed countries continue to dominate the field of science and technology to the extent that around 95 percent of all research and development is executed by them, while developing countries, which represent 70 percent of the population of the world, have only about 5 percent of the world's research and development capacity. . . . The

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1/ Idem.

> experience of the last few decades makes evident the need for determined measures on the international plane to redress this situation, for without such action the present inequitable situation will be aggravated further and the gap between developing and developed countries will continue to widen. 1/

The developing countries view UNCSTD almost totally in terms of using science and technology to help satisfy the goals of the New International Economic Order. Therefore among the specific demands enunciated by the developing countries in this preamble are "the elimination of monopolistic and oligopolistic conditions in the international flow of technology," the "national liberation of peoples and territories under foreign occupation . . ." to enable thse people to use their capacities to apply science and technology, protection of the biosphere, and ". . . concrete progress towards general and complete disarmament...which would release substantial resources that can be mobilized for accelerating

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1/ Preparations for the United Nations Conference on Science and Technology for Development. Position of the Group of 77 Regarding a Program of Action for the United Nations Conference on Science and Technology for Development. May 3, 1979. A/CONF.81/PC/CRP.23/Add.3.

the development of developing countries." 1/

Under this line of thinking, most of the actions demanded require vast economic and political changes that have continuously bedeviled the issue of improving science and technology cooperation between developed and less-developed nations. As Science magazine reporter John Walsh put it in a recent article, most of the issues which developing countries seek to raise at the conference relate to technology transfer and fundamentally therefore to the

". . . question of whether the United States is willing to reduce its comparative advantage in technology and, implicitly its standard of living to improve that of the LDCs." 2/

B. INTRODUCTION TO UNITED STATES POLICIES FOR UNCSTD, AS ENUNCIATED BY THE DEPARTMENT OF STATE

Official State Department policies partly coincide with developing country pronouncements that the meeting should address socio-economic obstacles to the application of science and technology to development, rather than specific issues of science and technology. According to the Department of State:

1/ Idem.

2/ John Walsh. U.N. Meeting in Vienna. Unlikely to Be a Waltz. Science, v. 204, June 1, 1979: 927.

> the main objectives of the UNCSTD are to: strengthen the developing world's scientific and technological capacity, determine ways to accelerate economic and social development through science and technology, and create appropriate instruments of international cooperation for transferring the necessary capacities and techniques. The conference is not intended to highlight the latest scientific advances, but rather to analyze development problems that might be resolved or alleviated with the aid of scientific and technical expertise. It will focus on the interrelationships among the political, scientific, and technological components of socioeconomic development.

Nevertheless, there are fundamental differences between the United States and the Group of 77 about what these obstacles are and how they might be overcome. U.S. efforts to formulate policies acceptable to the developing countries, which at the same time do not jeopardize vital U.S. domestic and foreign interests, are further complicated by the lack of consensus evidenced among interest groups in the United States: labor is opposed to actions which threaten American jobs, industry refuses to cede any control of its proprietary operations and information to developing countries, environmentalists seek only benign transfers and applications of technology, developmental specialists seek policies to promote basic human needs and appropriate technology growth, and scientists and technologists want a larger role in conference preparations, deliberations, and follow-up, to insure the creation of cooperative mechanisms for regional and international scientific and technological collaboration.

C. VIEWS EXPRESSED IN THE U.S. NATIONAL PAPER FOR UNCSTD

1. Emphasis on the Growth of Infrastructure and Meeting Basic Human Needs

The U.S. national paper for UNSCTD, Science and Technology for Development, for instance, emphasized that U.S. policy will stress

meeting basic human needs; modernizing infrastructure; and developing science and technology institutions in the developing countries. In contrast to developing country demands for rapid industrialization, the United States stressed application of S and T in specific substantive areas, such as energy, transportation and health. It also sought better management and policy direction of U.N. international science and technology activities, and pledged establishment of a Foundation for International Technological Cooperation (now called Institute for Scientific and Technological Cooperation) to promote growth of infrastructure and application of science and technology especially in "post-AID graduate" countries. The paper also stressed that modernization can and should proceed at the same time as basic human needs are being addressed.

2. Importance of Free Enterprise and Respect for Industrial Property

The paper described U.S. experience with private business, industry, and the "free enterprise" philosophy as critical to the development and utilization of science and technology in any country, but especially the developing countries. Technology transfer, it emphasized, ". . . must be a cooperative and joint effort of governments and the private sector, in which development priorities of the recipient countries are respected and in which private industries and organizations enjoy due protection and due returns on their investment and inventiveness." In contrast to developing country demands for control over foreign technology suppliers, the U.S.

position emphazied that effective business operations abroad require a stable and equitable economic, political, and legal climate in developing countries including a reasonable return on investments and a "protection of industrial and intellectual property rights."

3. Creating a Capability to Absorb Information; Restraint in Creating New International Institutions for Science and Technology

Successful transfer of technology to the developing countries, the paper emphasized, necessitates adequate preconditions or infrastructure growth to insure utilization of information, and identification of user needs and user capabilities. Adequate exchanges of technical personnel and information should insure that a recipient nation has the capability to apply the information transferred to specific national needs.

The paper took a restrained attitude toward proliferation of international institutions. It recommended creation of modest international information exchange networks and strengthening of U.N. capabilities and projects in science and technology by improving managerial control and accountability. But it rejected the demands made by some countries for creating new institutions within the U.N. to manage all U.N. science and technology related programs. The national paper also recommended that the UNCSTD should endorse some pilot activities involving joint collaborative efforts on science and technology for development.

The United States is attempting to convince nations to recognize that relationships with the developing countries should be based on the concept of shared problems and mutual responsibilities, rather than responsibilities working only in one direction. It is also attempting to move toward a diverse set of relationships with developing countries reflecting individual needs and interests of countries at different levels of development.

4. Proposal to Create a New International Science and Technology Institute

Only one initiative in the paper seemed radically different from previous U.S. foreign assistance programs. That is the proposal to create the Institute for Scientific and Technological Cooperation (ISTC). The Institute was first proposed by President Carter while in Caracas in March 1978. The U.S. national paper prepared for the UNCSTD described the Foundation as follows:

> The primary purpose . . . is to improve . . . knowledge and skills.... The [Institute] would work with all developing countries, including middle-tier countries in collaborative programs for this purpose. It would address problems of mutual concern to the United States and the Third World including the still unmet pressing needs of nutrition, health, and education and the major global problems of energy, natural resources development, and environmental protection. The [Institute] would be specifically structured to have developing country experts participate at all levels of . . . planning, programming, and evaluation to ensure a truly collaborative method of operation.

Funding for this initiative was included in the fiscal year 1980 budget and the House has passed a modified version of the proposal the President presented to the Congress to create the organization. The legislation adopted by the House is Title IV of H.R.

3324, passed April 10, 1979. The legislation is part of the President's proposal to create a new umbrella agency for foreign assistance, the International Development Cooperation Administration. The Senate defeated the proposal to create the Institute, on June 19, 1979. But expectations are that the Institute will be created after Conference Committee action. (See a more detailed discussion in section VIII. 4 below.) In its national paper the United States also encouraged other nations to establish similiar cooperative research/aid mechanisms to work especially with the "middle-tier" developing countries, whose representatives would "target" research priorities, and whose scientists would conduct much of the research undertaken. Since the ISTC would have a total budget of about $90 million, ($25 million in new funds and about $66 million in funds transferred from AID), it falls far short of the $2-4 billion international development fund called for by the Group of 77 in Target Areas B and C of the draft program of action for UNSCTD. Also it would operate bilaterally, not under international auspices, which is another demand of many developing countries which seek funding not under the control of single donor states.

IV. DIFFERENCES BETWEEN THE GROUP OF 77 AND THE UNITED STATES ON TARGET AREA A: STRENGTHENING THE SCIENTIFIC TECHNOLOGICAL CAPACITIES OF DEVELOPING COUNTRIES

The Group of 77 have categorized recommendations under each of the target areas in the draft program of action as responsibilities they should adopt, as action items for the developed countries, or as requirements for international agencies. Summarized next are the recommendations for action that developing countries want developed countries to take as an outcome of the UNCSTD, in target area A, "Strengthening the Scientific and Technological Capacities of Developing Countries," 1/ together with the U.S. alternative language as included in a document the Department of State prepared for the fifth prepcom and as evidenced in discussions at the fifth "prepcom."

A. The Introduction

1. Position of the G-77: Need to Manage the Supply and Demand of Technology

This target area deals with ways the developing countries can develop indigenous capacity for developing science and technology, including such factors as writing national science policy plans, establishing research centers and developing R and D funding priorities.

The introduction to the document stressed that technology is a "free right" of all mankind. The growth of science and technology capacity in the less developed countries has been hampered by the

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1/ Preparations for the United Nations Conference on Science and Technology for Development. Text Resulting From Informal Consultations, held from 26 April to 3 May 1979, on Document A/CONF.81/PC/CRP.2, Relating to a Programme of Action for the . . . Conference. Target Area A. May 3, 1979. A/CONF. 81/PC/CRP.5.

erroneous assumption "...that 'demand' for science and technology would automatically emerge from the productive system 'or the normal course of economic growth.' This, however, has not been the case and there is a clear need to adopt measures to create, stimulate, and promote the 'demand' for endogenous scientific and technological activities, and for goods and services containing national and regional technology." Both supply and demand for technology must be managed. This implies a need for international aid to promote economic growth to force demand and to generate supply. Therefore, both industrialization and financial aid policies are intimately related to promoting a developing country's scientific and technological growth. The developing countries propose actions they, themselves, should take individually or on a regional basis. These include:

- writing "national science and technology policies," and "inventorying science and technology resources and needs,"

- establishing research and applied technological, managerial, assessment, training, and diffusion mechanisms,

- developing research and development centers, and

- developing domestic policies for regulating technology transfer, including eliminating restrictive business practices, establishing mechanisms to monitor activities of transnational or multinational corporations, so that technology can be "unpackaged" or "unbundled" to permit developing countries to determine its cost structure (i.e., its effect on job creation, use of natural resources, effect on import substitution policies, etc.) so as to seek MNC operations with the most favorable terms.

Developing countries want to force MNC manufacturing subsidiaries to use locally obtained raw materials and resources and develop national science and technology user information systems. Agricultural and industrial extension services are encouraged. Developing nations also demand that developed nations reallocate R&D funding from arms and nuclear research to civilian research on development issues.

2. Position of the United States: Infrastructure Growth to Aid Demand

The alternative introductory statement suggested by the United States, in contrast, stressed that while foreign and international assistance are needed to overcome disparities between nations and the difficulties of developing countries in growth, the basic obstacle to development is not MNC operations, but the lack of a science and technology infrastructure:

> Lack of a science and technology infrastructure, such as an appropriate educational system, science and technology institutions, mechanisms for popular participation, science and technology experiences, and a capacity to assess technology, constitutes the most serious obstacle for developing countries in achieving a self-sustained and autonomous development. The building up of an infrastructure is thus a prerequisite for such a development.

This statement reflects one of the fundamental policy objectives of the United States: that the promotion of institutional infrastructure within the developing countries is one of the most important target areas for future action. 1/ The United States wants to force the most important but instransigent sectors of developing countries

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1/ Preparations for the United Nations Conference on Science and Technology for Development. United States of America: Amendments to Document A/CONF.81/PC/CRP.5 (Target Area A), and A/CONF.81/PC/CRP.2/Add.1 (Target Area B.) June 22, 1979. A/CONF./81/PC/CRP.8., p. 3

--- the public, industrialists, politicians, and researchers --- to examine their own needs and the obstacles to the growth of economic and scientific infrastructure so as to integrate dualistic economies, where the rich get richer and the poor get poorer. The U.S. document also recommended that developing countries take national, subregional, regional, and multinational collaborative action to try to stimulate demand and to solve these problems. 1/

In an effort to overcome charges that promotion of infrastructure growth tends to enhance the power of entrenched elites and to aggravate dualism in socio-economic structures, the United States emphasized that developing countries should develop educational curricula to train students in skills necessary to meet basic human needs, as well as to provide highly skilled technicians. Others programs included supporting the growth of indigenous infrastructure and training developing country nationals in the United States, an effort which would have secondary domestic benefits of filling the slack in enrollment in institutions of higher education.

3. Disagreement on Demands to "Unpackage" Imported Technology

In Section A.11 of the draft program, the Group of 77 gives developing countries the right to develop a capacity to "unpackage" technologies imported to determine supplier costs and identify

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1/ See also statement by Ambassador Jean Wilkowski, U.S. Mission to the United Nations Press Release, Jan. 30, 1979. U.S. Department of State. Preparatory Committee for the U.N. Conference on Science and Technology for Development, 2nd Session. Jan. 21-Feb. 3, 1978. Position Paper. U.S. Department of State. Telegram, May 13, 1979, [regarding U.S. Delegation to the UNCSTD views of Prepcom IV.]

whether components can be supplied internally or more cheaply from other suppliers. The United States suggested that this paragraph be removed and replaced with a much more benign unpackaging statement based on language agreed upon in UNCTAD V deliberations:

> Developing countries should develop the capacity to make adequate arrangments as regards unpackaging in terms of information concerning the various elements to be transferred such as that required for technical, institutional, and financial evaluation of the transactions, thus avoiding undue or unnecessary packaging. 1/

4. U.S. Demand for International Law to Underlay Information Systems Dealing With Technology Transfer

The Group of 77 demands to establish national control over technology assessment, transfer, acquisition and adaptation (paragraphs A. 12, 13 and 14), call for such things as establishing national mechanisms to assist in gathering information about MNC operations to control the choice of technology and support domestic innovation, to monitor investments, to lay down standards for MNC operations, to direct foreign investment, and to force use of local manpower in MNC operations. The United States, while endorsing some of these demands, added language to insure that "official measures should be consistent with international obligations, treaties and agreements." 2/

5. Differences in Demands Dealing With Domestic Technical Information Systems

The United States and the Group of 77 disagreed also on demands relating to information systems (Paragraph A.15.) The Group of 77

1/ U.N. A/CONF.81/PC/CPR.8, Prepared by U.S.A., op. cit., p. 5

2/ Ibid., p. 7.

specified the kinds of information that should be included in domestic information systems, such as all information required for science and technology development, information pertaining to foreign sources of technology, foreign cost structures, and sources of foreign capital. The United States suggested that changes be made to emphasize the criteria for establishing information systems, rather than the information they should contain:

According to the U.S. delegation, special attention should be given to:

- facilitating the use of data services by the technology communities,
- sectoral problem-specific data banks on available technology,
- linkages between researchers, administrators and users . . . ., and
- training in personnel in the effective development and use of such systems. 1/

The developing countries also included demands for the establishment of their own regional information systems (Paragraph 32) and networks to exchange information on training and education, conditions for the transfer of technology, terms of foreign investments and activities of MNCs, and experiences in particular substantive areas. (A. 32.) The United States objected to these recommendations, questioning the wisdom of regional information systems, 2/ and finding it impossible to agree to create systems which would include proprietary information about intra-firm activities of MNCs.

1/ Ibid., pp. 8-9.

2/ Ibid., p. 11.

Included next is a summary of the Group of 77 recommendations for actions that developed nations should take (as expressed) in recent draft plans from "prepcoms" 4 and 5, to achieve the goals of target area A, together with relevant U.S. alternatives as suggested in documents prepared for Prepcom 5.

B. TARGET AREA A. MAJOR ELEMENTS OF SCIENTIFIC AND TECHNOLOGICAL COOPREATION POLICIES. RECOMMENDATIONS FOR ACTIONS TO BE TAKEN BY DEVELOPED NATIONS

1. International Institutional Arrangements: Research Programs and Expenditures (A.42:)

Developed countries should:

- increase the availability and distribution to the developing countries of developed country research and development results that are relevant to social and economic development,

- increase the proportion of national research expenditures devoted to problems of development,

- help the developing countries increase their capacity to produce and market capital goods,

- establish direct links between research and development systems of developed and developing countries and undertake joint research where possible, and

- hasten to establish intergovernmental commmissions to govern the conduct and apportionment of joint research between developed and developing countries.

The United States recommended that these demands be modified essentially to read that the developed nations should make the results of research and development available, but only when possible, and that the developed nations limit their increased research efforts (on behalf of developing nations) only to agreed upon priorities. The United States sought to delete the other provisions on the grounds that the demands should be limited to "what can be accomplished in

practice, given the legal systems existing in most developed countries." 1/

2. Technology Transfer [Codes] and Assessment (A.43-A.46): The developed countries should:

- provide access under just and equitable terms "...to all types of technological know-how and to all technologies not only to the basic and conventional ones, but also to the most complex and advanced, such as nuclear technology for peaceful uses, microelectronic technology, and space technology,"

- take measures to prevent the creation of restrictions on the flow of technology to the developing countries,

- eliminate quality control import barriers for goods exported by developing countries to developed country markets,

- "grant preferential treatment to firms and industries of developing countries in the area of licensing, patent rights, and know-how," and

- reorient foreign aid criteria so that LDCs can receive aid specifically to strengthen their innovative capacities.

The United States found these demands unacceptable on the grounds that neither this nation nor other developed countries "have legal systems which would permit them to offer preferential access to proprietary technology," and that the demands were not entirely related to the UNCSTD, since they are being negotiated in other forums. 2/

3. Scientific and Technological Information Systems [to Permit Free Access to Proprietary Information of TNCs and to Other Commercial Databases] (A.47): The developed countries should:

- establish regional and international information systems which link developed country national technical information

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1/ Ibid., p. 12.

2/ Ibid., p. 12.

systems (public and private), to a user access point in all developing countries,

- eliminate all restrictions on the reproduction and translation of scientific and technical journals and information,

These demands were unacceptable to the United States. The proposed alternative text reads:

> Developed countries should take appropriate measures to facilitate and expedite the licensing for reproduction and translation of scientific and technical journals and materals in accordance with the 1971 revisions of the Universal Copyright Convention and the Berne Copyright Convention. 1/

4. Development of Human Resources, [Including education, training, etc.] (A.49): The developed countries should:

- cooperate with LDCs by providing fellowships for students of the LDCs to study abroad, provide training programs for LDC scientists and technologists in the LDCs, and provide more free training,

- train LDC nationals in institutions located in the LDCs in the skills of technology management,

- aid in educating LDC nations about the mechanisms of technology transfer and the impacts of technology on society,

- enter into negotiations to reverse the "braindrain,"

- aid LDCs by providing financing and technical information to help them undertake research projects they have identified as critical to development.

The United States did not object to these demands. However, it suggested that language be added to insure that developed and developing countries cooperate in "encouraging an expansion of market intermediation services including technology brokerage services" to

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1/ Ibid., pp. 12, 13.

facilitate technology transfer, and that developed countries support moves by international organizations to find solutions to the brain drain problem. 1/

5. Financial Arrangements, [to create an International Science and Technology Development Fund, Endowed Annually by Developed Nations at the Rate of $2 Billion to $4 Billion] (A.50-.54): The developed countries should aid in:

   - setting up in the U.N. an International Science and Technology Development Financing System. The Group of 77 has not yet agreed fully on all details of the funding mechanism. Receiving greatest is a proposal advanced by the Andean Pact nations: that the funds should be made up of contributions based on an agreed percentage of the average deficit in the trade balance in manufactured goods between the developing and developed countries for the for the preceding five years. 2/ Another method discussed for financing was from a tax paid by developed countries to compensate for the braindrain from developing countries. The Group sought establishment of a fund supported wholly by the developed nations, endowed at the annual rate of $2 billion by 1985 and $4 billion by 1990. Developed nations would have no control over fund disbursement.

The United States recommended that this paragraph be deleted and modified under Target Area C. 3/ See below, section VI. The United States objected to creation of another fund for development on the grounds of: fiscal austerity, congressional objection to U.N. funds which require mandated assessments from developed nations,

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1/ Ibid., p. 13.

2/ The proposal was developed by the Andean Pact nations and appeared in an official U.N. document as Annex III. Financing System for the Technological Developmenmt of the Third World. In Preparatory Committee for the United Nations Conference on Science and Technology for Development. Report of the Latin American Regional Preparatory Meeting. Jan. 16, 1979. A/CONF.81/PC.16. See also: David Dickson, Third World to demand new fund for scientific development. Nature, v. 279, Masy 3, 1979: 6-7.

3/ U.N. A/CONF.81/PC/CPR.8, Prepared by U.S.A., op. cit., p. 13.

rejection of "automaticity" contribution formulas, and objection to international funds in which decisionmakers have no control over financial disbursements, i.e. over spending for "targeted" programs.

6. [Terminate R and D Funding for Arms Research; Devote More Resources to Research on Development.] Developed countries should:

   - "reorient their financial policies, redeploy resources from the arms race and armament research" and use the funding for civilian research for developing country problems, and

   - "devote on an annual basis .05% of their gross national product to the solution of scientific and technological problems of developing countries. They should also devote at least 10% of their research and development expenditures to programmes designed to solve problems of specific interests to developing countries."

The United States reacted to these demands by removing specified targeted sums or percentages for increasing development aid. It recommended instead that the developed nations be encouraged to devote larger sums of money to solution of science and technology problems and that they increase (but without specifying a quantitative target) their research and development on development problems. 1/

7. [Untie Loans and Grants and Use Materials Procured in the LDCs]: Developed countries should insure that:

   - grants, loans, credits and other types of contributions to international organizations are untied, and

   - bilateral financial mechanisms are changed to provide developing countries with untied, unrestricted aid; and that development projects should use locally procured materials,

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1/ Ibid., pp. 13-14

The United States recommended a change in the language immediately above to indicate that bilateral finance mechanisms should be encouraged where possible to increase use of locally procured services. 1/

C. ARRANGEMENTS FOR INTERNATIONAL ORGANIZATIONS (A.55):

A summary of the action recommendations for international organizations, which involve developed nations, are summarized next:

- aid developing nations by providing advisory services to help develop science and technology policies,
- aid in developing analytical methods and techniques for assessing R and D needs,
- develop policies to mitigate the braindrain,
- promote regional cooperation in science and technology,
- consider setting up a global S and T information network on problems of the application of S and T to development,
- aid in training and setting up fellowship programs,
- establish a system to reward LDC scientists publicly, and
- insure that international financial institutions give more aid for S and T to be used for development research.

The United States alternative text sought removal of the requirement that international financial institutions increase aid for science and technology and developmental research. 2/

1/ Ibid., p. 14

2/ Ibid., p. 14.

V. DIFFERENCES BETWEEN THE UNITED STATES AND THE GROUP OF 77 ON TARGET AREA B: RESTRUCTURING THE EXISTING PATTERN OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL RELATIONS

Target Area B is titled "Restructuring the Existing Pattern of International Scientific and Technological Relations." The position paper of the Group of 77 emphasized that the developed nations dominate the world technologically and that MNCs dominate the world's commercial technology. It calls for international structural changes to achieve an "unrestricted exchange of knowledge and experience" in order to promote integrated international development and to "help the weaker and the more vulnerable countries and also optimize the utilization of the finite global resources." 1/

A. DEMANDS FOR INTERNATIONAL STRUCTURAL CHANGES IN SCIENCE AND TECHNOLOGY RELATIONS AND CAPACITY: THE INTRODUCTION BY THE GROUP OF 77

A number of fundamental structural changes are required in the distribution of scientific and technological capacities to allow developing nations to participate in the world production and use of scientific and technical knowledge, the Group of 77 contented. The principal objective ". . . is the gradual eradication of the existing assymmetries" such as:

(a) disparities in the production and exchange of scientific and technical knowledge and information,

(b) disparities in the capacity to control scientific and technological options,

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1/ Preparations for the United Nations Conference on Science and Technology for Development. Position of the Group of 77 Regarding a Programme of Action for the United Nations Conference on Science and Technology for Development. Target Area B. Restructuring the Existing Pattern of International Scientific and Technological Relations." May 1, 1979. A/CONF.81/PC/CRP.2/Add.1.

(c) disparities in the rate of production of new products and capital goods,

(d) assymmetry of the technological market,

(e) financial disparities rooted in the absence of integrated capital accumulation circuits in developing countries, and

(f) assymmetry in the availability of scientific and technological resources devoted to development purposes, arising out of the highly concentrated utilization of such resources by developed countries for military purposes. 1/

B. UNITED STATES REJECTION OF THESE DEMANDS AS INIMICAL TO FREE ENTERPRISE, AND DEVELOPMENT, AND AS INAPPROPRIATE FOR UNCSTD

The United States undoubtedly considers this agenda item one of the most contentious in the conference. Some parts of the Group of 77, notably the Latin American nations consider privately held technology overpriced and exploitatively managed and seek to obtain control over the actions of foreign companies. The United States declines to interfere directly in the marketplace. In contrast, it is attempting to support the twin goals of altering the incentive and regulatory patterns within the marketplace and providing assistance to developing countries to assess, manage, and adapt industrial technology. The United States is also seeking to aid developing countries eager to industrialize by examining ways to encourage the U.S. private sector to invest in public sector technologies needed in the Group of 77 countries, such as in agriculture and health.

The UNCSTD is not the appropriate forum to negotiate demands relating to technology transfer, according to the United States, because

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1/ Ibid., p. 4

these issues are being negotiated in other international forums, such as the U.N. Conference on Trade and Development (UNCTAD), the multilateral trade negotiations, in meetings dealing with the General Agreement on Tariffs and Trade, in the Paris meetings on Revision of Patent Conventions, and in groups dealing with international information flows, such as UNISIST, the U.N. world scientific information system.

As a response to Group of 77 demands, the United States is promoting adherence to a voluntary code of technology transfer, which would guide, but not restrain negotiations between parties. The Group of 77, on the other hand, is promoting a legally binding code of technology transfer to govern the actions of MNCs.

The American delegation to the fourth "prepcom" reported its objections to most of the assumptions and demands in agenda item B as follows:

- it is an erroneous premise that governments of developed countries exercise control over creation and conditions of dissemination of technology in the private sector,

- the assumption is inaccurate that technology is a "freely available good," and should be free of cost or at a nominal price to developing country users,

- Developing countries erroneously have a tendency to emphasize the need to restructure the pattern of international S and T relations in terms of Government policies, institutions, rules, and regulations, and codes of conduct, rather than focusing on more concrete efforts to improve indigenous S and T capability needed to achieve LDC economic and social objectives, and

- Developing countries tend to emphasize access to S and T information as a key to rapid development without adequate attention to the skills necessary to define and to identify, evaluate, select, disseminate and utilize technologies. 1/

1/ Telegram, op. cit.

The Department of State prepared an alternative introductory statement for Target Area B, emphasizing these notions, which was presented for discussion at the fifth "prepcom." It noted that while the benefits of industrial technology have not been distributed equally throughout the world, it is not easy to specify all the factors -- or indeed any one particular factor as the major cause of success or failure in international technology relations. Foreign technology suppliers are not always the cause of failure, since "developing countries need to improve their capacity for autonomous decisionmaking concerning the suitability and effects of foreign technology in the context of their individual social and economic development goals and technology priorities." 1/ Governments should recognize that private industrial concerns are essential for development. Therefore: In addition to building absorptive capacity, national policies, rules and regulations should encourage overall conditions conducive to technology flows on mutually beneficial, fair and reasonable terms and conditions. Competititve international markets are required to insure that the LDCs have the widest possible choice of sources of technology.

C. U.S. REJECTION OF DEMANDS FOR INFORMATION SYSTEMS GIVING ACCESS TO PROPRIETARY TECHNOLOGY, EMPHASIS ON CREATING DEMAND AND IMPROVING USE

Rejecting demands for the creation of international information systems in providing developing countries with free or low cost access

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1/ U.N. A/CONF.81/PC/CRP.8. Prepared by U.S.A., op. cit. p. 16.

to public and private technical information as an inappropriate response to the need for better technical information flows in the developing countries, the United States suggested that the major obstacle to adequate information use is the inability to absorb and use the information that exists:

> The principal constraint on access to information of this nature lies in inadequate capacities to identify specific needs and productively to search existing facilities. There is a need to broaden awareness of how much information is already available and of ways of obtaining access to it. There is also need to identify information relevant to development. Although information is essential, it is widely recognized that "information" as such is not sufficient to achieve national economic and social goals. How to select and use information effectively is a substantially more demanding task than obtaining access to information. 1/

In contrast to creating elaborate new information networks, as recommended by the LDCs, the United States recommended what it saw as less ambitious but potentially more rewarding efforts:

> Nongovernmental networks of institutions and individual scientists and technologists concerned with common problems offer an effective approach to cooperation that is probably under-utilized today. Such networks should be encouraged, along with the improvement of existing U.N. and other international systems. 2/

D. DEBATE ON SPECIFIC RECOMMENDATIONS IN TARGET B

Recommendations for actions to be taken by the developed countries and U.S. responses are:

1. Acquisition and transfer of technology (B2. (a)-(c)) The developed countries should:

- ensure free access to technologies, including advanced needed for development,

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1/ Ibid., p. 18.

2/ Idem.

The United States objected to this provision and recommended substitution of text conforming with UNCTAD V, Res. 13 (c)· "Facilitate access by developing countries to those technologies, that are essential to their development, including as appropriate, advanced technologies, as well as to the achievements of modern science and technology." 1/

2. LDC Demand for Non-restrictive Conditions to Purchase Technology
The developed countries should·

- create favorable non-restrictive and non-discriminatory conditions for LDCs to purchase needed technology,

The United States recommended that this language be changed to the less mandatory policy of developing countries taking steps to encourage that technology be supplied on mutually beneficial terms. 2/

3. LDC Demand for Tax-relief for MNCs for Developmental Work
The developed countries should

- provide incentives including tax relief by developed countries for companies that transfer technologies non-restrictively and by means of joint ventures.

The United States objected to this recommendation and substituted text that such incentives should be in accord with national policies, law and regulations, and recommended the addition of a paragraph to read that developed countries should provide technical assistance and skills training to LDCs to acquire skills necessary to identify technology needs and an ability to select, acquire, generate and apply technologies. 3/

1/ Ibid., p. 20.

2/ Idem.

3/ Ibid., p. 20.

The developed countries should:

- provide better and free access to, as well as transfer to developing countries of technologies in the public domain, (B.3).

The United States changed this provision to emphasize that developed countries should take whatever steps are possible to give LDCs access to technology available in the public domain, and that information about such technology be made available. 1/

4. Developed Countries Should Better Manage Subsidiaries of MNCs in LDCs

Developed countries should:

- establish machinery to govern and manage MNCs with subsidiaries in developing countries to achieve these aims, (B.4).

The United States recommended modification of these provisions to read:

> Governments of developed countries should cooperate closely with governments of developing countries with a view to maximizing the contributions which transnational enterprises can make to strengtening the science and technology capacities of developing countries, while remedying any negative effects of these enterprises. 2/

E. RECOMMENDATIONS FOR ACTION AT THE INTERNATIONAL LEVEL

Recommendations are also given for actions to be taken at the international level to achieve these aims.

1. Demands for Legally Binding Code of Conduct for Technology Transfer

Those of relevance to the developed countries include such things as:

1/ Ibid., p. 21.

2/ Ibid., p. 21.

- "all countries should fully recognize the sovereign right of each State to regulate and exercise authority and jurisdiction over the acquisition of foreign technology," (B.4)

The United States delegation recommended modification of this paragraph to insure that such authority respect international law. 1/

Another demand was:

- all countries should strive toward developing an international legal framework that guarantees equitable technology transfer processes, including "a code of conduct on the transfer of technology, a code of conduct on transnational corporations, the revision of the Paris Convention on the Protection of Industrial Property Rights, and the provision of copyrights on favourable terms to developing countries. . . ."

The United States recommended modification of these provisions to delete requirements for the establishment of international legal frameworks guaranteeing technology transfer codes and recommended the use of wording which would encourage the creation of an international economic and legal environment which facilitates mutually beneficial transfer processes. It also recommended deletion of language regarding copyrights, saying that "the current text of Bern and ICC copyright Conventions already provide for favorable treatment for developing countries." 2/

1/ Ibid., p. 23

2/ Ibid., p. 21.

F. RESTRUCTURING OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEMS RELEVANT TO THE REQUIREMENTS OF THE DEVELOPING COUNTRIES

Developed countries, according to the Group of 77, are to:

- establish a global information network, headquartered in and governed by the U.N. that would make public or private (i.e. commercial) technical information accessible to the LDCs, free of charge or low cost (B.11.a).

The United States, objecting to elaborate global information networks of this sort, added "to the extent possible," and deleted language permitting free or low cost access to commercial information systems. Concessional terms were substituted. 1/ In addition the United States wanted to see language added to insure that the proposed system avoids duplication with existing UNESCO and UNISIST information systems. (The latter is a World Science Information network.)

The Group of 77 also demanded that the developed countries should:

- provide developing countries with information regarding transactions of TNCs, to "counteract . . . the opacity often surrounding their transactions."

The United States recommended that these demands be substituted with the following language:

> Identify mechanisms by which to assist in the development of skilled manpower in developing countries to improve their capacities to utilize and exploit available information on science and technology. 1/

1. Creation of a Global S and T Information Network Under U.N. Auspices

The Group of 77 recommended that the developed nations:

1/ Ibid., p. 24.

- participate in the establishment of an international information network, under U.N. auspices, with a "national focal point," i.e. sending, receiving, and governing center, to be located in each developed and less developed country to provide rapid technical information flow: each "focal point" should be managed by capable people trained with user requirements, (B.13.)

- information systems should be constructed so as to give users an ability to analyze appropriate ways to select and use a relevant technology.

G. ELEMENTS OF INTERNATIONAL COOPERATION IN SCIENCE AND TECHNOLOGY RESEARCH

The following actions were suggested for the developed nations to take to improve international cooperation in science and technology according to the Group of 77:

- developed countries should do more cooperative R and D and training relevant to strengthening the development processes of the developing countries,

- developing countries should choose from their own priorities when deciding to engage in cooperative research requiring their participation; such cooperative projects should promote training for locals, engage indigenous scientists in leadership roles, make maximum use of laboratories in developing countries; Developing countries should control the use and dissemination of data gathered in the project, developed countries should adhere to environmental quality and ethical standards when testing drugs or chemicals and identify the ecological impacts possible.

- developed nations should agree to permit developing countries to control the conduct of international projects conducted under auspices of international agencies.

VI. DIFFERENCES BETWEEN THE UNITED STATES AND THE GROUP OF 77 ON TARGET AREA C: STRENGTHENING THE ROLE OF THE UNITED NATIONS SYSTEM IN THE FIELD OF SCIENCE AND TECHNOLOGY AND THE PROVISION OF INCREASED FINANCIAL RESOURCES

The Group of 77's position for Target Area C, entitled "Strengthening the Role of the United Nations System in the Field of Science and Technology and the Provision of Increased Financial Resources," is still under development. It deals primarily with the Group's views of steps that should be taken within the United Nations system to meet the science and technology related objectives of the NIEO. Many of the proposals made have implications for the developed countries.

A. PROPOSALS BEING DISCUSSED TO REORGANIZE S and T IN THE UNITED NATIONS

Several proposals are being discussed for revising procedures and institutional structures within the United Nations to deal with science and technology. 1/

One is to create an entirely new agency charged with overall coordination of science and technology for the entire U.N. system. The agency proposed would also be responsible for conducting research linked to the explicit science and technology objectives of the U.N. system and would synthesize data on all of the U.N system's research

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1/ Preparations for the United Nations Conference on Science and Technology for Development. Report of the Advisory Committee on the Appication of Science and Technology to Development. Note by the Secretary-General of the Conference. May 21, 1979. A/CONF.81/PC/38, pp. 44-49.

For more detailed background see pp. 87-97 of the House Foreign Affairs Committee print cited earlier: United Nations Conference on Science and Technology for Development -- A Background Paper.

programs to assess the degree to which objectives were being met and goals achieved.

Another proposal is to create a program for science and technology activities that would function within the United Nations system, arranging concerted action between two or more U.N. agencies in well-defined activities relating to the application of science and technology to development. Unlike the institution proposed above, this program would have no operational activities of its own nor would it conduct any independent research and analysis. Some have recommended that such a program be supplied with special funding or be given a special mandate and name such as was done for the U.N. Environment Program.

A third alternative is to create a center for concerted action and coordination on science and technology. It would synthesize all information on science and technology programs and strategies, advise the Secretary-General regarding science and technology related subgoal objectives of other U.N. bodies and relate these to general science and technology goals. It would be small and refer research questions to other organizations in the system or to ad hoc advisory expert groups.

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B. PROPOSAL OF THE GROUP OF 77 FOR A NEW U.N. AGENCY: "THE INTERGOVERNMENTAL COMMITTEE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT"

The Group of 77 in their reorganized program of action for Target Area C, 1/ recommended creation of a special high-level intergovernmental body, called the "Intergovernmental Committee on Science and Technology for Development." The Committee would act under the authority of the General Assembly. It would be responsible for monitoring national efforts and carrying out the responsibilities given to the U.N. to implement UNCSTD action recommendations to achieve the restructuring of the international scientific and technological order necessary to achieve the NIEO goals of owning and producing 25% of the world's output in manufactures by the year 2000.

The new U.N. body would formulate comprehensive long-term science and technology plans for the whole U.N. system, formulate plans to implement the program of action adopted by UNCSTD in Vienna, and monitor, link, and mobilize resources within the U.N. itself to carry out the recommendations for implementing the plan. It would be entrusted with the responsiblity of setting in motion steps to achieve another of the demands of the LDCs: that they conduct a minimum of 20% of the world's R and D by the year 2000. Special functions devolving onto the body would include information exchange

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1/ Preparations for the United Nations Conference on Science and Technology for Development. Position of the Group of 77 Regarding a Programme of Action for the United Nations Conference on Science and Technology for Development. Target Area C - Strengthening the Role of the United Nations System in the Field of Science and Technology and the Provision of Increased Financial Resources. June 29, 1979. 12 p. (A/CONF.81/PC/CRP.2/ADD.2 /Rev. 1*)

responsibilities of the U.N. with respect to technology transfer codes and development of human resources, identification of priorities for the application of science and technology in specific substantive areas relevant for development, and initiation of arrangements for the establishment of an early warning system of new scientific and technological developments which may affect the development process."

The Group of 77 also recommended that the Director-General for Development and International Economic Cooperation of the United Nations should be responsible for exercising overall coordination at the Secretariat level for science and technology activities of the U.N. system.

C. U.S. OBJECTIONS TO THESE DEMANDS FOR A NEW INTERNATIONAL S AND T GOVERNING BODY: RECOMMENDATIONS INSTEAD FOR FINE-TUNING THE U.N. SYSTEM

The United States, in contrast, recommended a fine-tuning of the management and administrative structure within the U.N. to carry out its science and technology responsibilities rather then the establishment of new mechanisms. This proposal was expressed in the alternative language for Target C, proposed for discussion at "prepcom" 5, by the Department of State. 1/

Science and technology activities of the United Nations, according to the U.S. document, should focus on strengthening development

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1/ Discussion on Target Area C. In: U.N. A/CONF.81/PC/CRP.8, op. cit. Prepared by U.S.A.

of indigenous capabilities in developing countries and take into account the existing intersectoral programming and coordination of the activities of the various U.N. bodies. These activities should be harmonized, according to the State Department, with the development strategies to be incorporated into the International Development Strategy for the Third Development Decade. In achieving these aims, U.N. planners should recognize the differences in level of development among the various Group of 77 countries.

Responsibility for these activities, according to the official U.S. position paper, should be vested with the existing Committee on Science and Technology for Development (CSTD), exercising its activities through the Economic and Social Council. The U.S. delegation also recommended that the Director-General for Development and International Economnic Cooperation exercise coordination within the Secretariat, and that the Office of Science and Technology in the Department of International Economic and Social Affairs continue to provide substantive secretariat services to U.N. bodies dealing with science and technology. The State Department also recommended that the Advisory Committee on Science and Technology for Development (ACAST) continue to be used and that the United Nations Development Program, as the central program in the U.N. system concerned with technical cooperation with the developing countries, strengthen the role of science and technology throughout its operational activities.

D. UNITED NATIONS INVENTORIES OF FUNCTIONS DEALING WITH SCIENCE, TECHNOLOGY, AND DEVELOPMENT

In preparation for UNCSTD discussions that might deal with reorganizing and better coordinating the U.N. agencies' functions in science and technology for development, the Secretariat of the UNCSTD Preparatory Committee prepared a few documents which inventory activities and assess how separate parts of programs, now conducted by different U.N. agencies, could bettter serve development purposes if they were administered on a functional or cross-agency basis. The typology of functional program areas used in the reports includes the categories of: policy-making; criteria for choice, assessment and selection of technologies; development of guidelines and practices for the transfer of technology; standards and metrology; linkages between producers and users of the results of research and development; application of technology and project implementation; information systems; popularization of science and technology; skilled personnel; and financing of science and technology. The reports are titled: Analysis of the Resources Available Within the United Nations System for Strengthening the Scientific and Technological Capacity of Developing Countries, 1/ and Summary of Cross-Organizational Analysis of Programme Activities Within the U.N. System in

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1/ U.N. Preparatory Committee for the United Nations Conference on Science and Technology for Development. Analysis of the Resources Available Within the U.N. System for Strengthening the Scientific and Technological Capacity of Developing Countries. June 25, 1979. A/CONF.81/PC/44, various pagings.

the Field of Science and Technology for Development. 1/

E. PROPOSALS MADE BY THE GROUP OF 77 FOR A U.N. FINANCING SYSTEM FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

The Group of 77 recommended that the UNCSTD recommend establishment by January 1981 of a "U.N. Financing System for Science and Technology for Development." The system would be used to fund all the national as well as U.N. responsibilities mandated by UNCSTD. It would be funded on the basis of voluntary as well as assessed contributions. The Group of 77 recommended an ". . . annual target for the financial resources of the System of at least $2 billion by 1985 and at least $4 billion by 1990." As noted above the proposal was espoused initially by the Andean Pact countries, a caucus within the Latin American group of the Group of 77. Contributions from developed countries would be calculated on the basis of a percentage of the average quinquennial surpluses of developed countries in their balance of trade in manufactured goods with the developing countries. Initial U.S. contributions would average about $200 million annually, as calculated by the Andean Pact countries in a supplementary document submitted to the last "prepcom." See table A below. 2/

1/ U.S. Preparatory Committee for the U.N. Conference on Science and Technology for Development. Summary of Cross-organizational Analysis of Programme Activities Within the U.N. System in the Field of Science and Technology for Development. June 29, 1979. A/CONF.81/PC/43, 34 p.

2/ [Luis Soto Krebs.] Financial System for the Technological Development of the Third World. Proposal Made by the Andean Countries (Bolivia, Colombia, Ecuador, Peru and Venezuela): Updated Statistics, June 14, 1979, various pagings.

Table A.

Andean Pact: Financial Plan Proposed for UNCSTD. Proposed Initial Annual Contributions of the OECD Countries to the Under-Developed Countries by Geographic Zones, Based on the Period 1971-1975
(in thousands of dollars)*

To: / From:	America	Asia	Africa	Total
Canada	9,940.9	2,415.2	1,499.3	13,856.4
United States	125,114.2	52,690.6	20,177.1	197.987.9
Japan	56,530.3	146,187.5	54,794.3	257,512.1
Australia	731.8	3.897.1	484.0	5,112.9
Austria	1,683.1	6,828.0	2,101.8	10,672.9
Belgium-Luxembourg	6,637.2	9,071.8	7,121.0	22,830.0
Finland	1,586.0	1,309.6	901.7	3,797.3
France	15,020.5	25,714.0	63,915.3	104,649.8
Germany	45,381.1	75,048.0	37,191.2	157,620.3
Greece	-23.0	1,544.8	1,448.4	2,970.2
Iceland	3.9	-22.8	3.1	-15.8
Ireland	124.7	108.0	190.4	423.1
Italy	17,164.3	37,085.3	26,812.1	75,081.7
Holland	7,707.9	9,536.6	8,092.5	25,307.0
Norway	-158.5	1,848.3	4,158.5	5,846.7
Portugal	285.4	309.0	1,487.6	2,082.0
Spain	7,821.5	4,217.3	6,374.5	18,413.3
Sweden	8,058.5	6,635.4	5,739.5	20,433.4
Switzerland	9,190.1	10,440.6	4,721.2	24,351.9
United Kingdom	20,565.8	43,063.7	31,712.6	95,342.1
Total	335,415.2	434,078.8	281,455.1	1,050,949.1

* This table was translated from Luis Soto Krebs. Financial System for the Technological Development of the Third World. Proposal Made by the Andean Countries (Bolivia, Colombia, Ecuador, Peru and Venezuela). Upadated Statistics. The source cited is: Statistical Information of the OECD: World Trade Data, 1971 to 1975, Prepared by the Statistics Section of the Junta Del Acuerdo de Cartagena, Andean Pact.

F. U.S. OBJECTIONS TO THE FINANCIAL PROPOSALS OF THE GROUP OF 77

U.S. diplomats at the U.N. oppose this plan for several reasons. One is the matter of sheer fiscal austerity. There is also the real fact that the U.S. Congress in September 1978 placed a restriction on U.S. funding for assessed contributions to the U.N. agencies, prohibiting their use for technical assistance activities. The rationale was that Members of Congress believed technical assistance funds should be provided and coordinated through voluntary rather than assessed contributions. While the State Department objected to this prohibition, it often finds itself in accord with another stated reason for opposing the financial system proposed by the Group of 77. This is that most nations prefer bilateral or unilateral aid mechanisms which they can control. They are opposed to international aid being disbursed from an agency dominated by the Group of 77, where the United States would find little or no opportunity to see that funds are spent on priority targeted areas compatible with U.S. foreign policy goals, national interests, and in the opinion of some, equitable developmental policies.

The State Department criticized this proposal and noted officially that it is not prepared to contribute any new funds unless the developing country and the United States can first reach agreement on sectoral priorities -that is specific targeted and programmed areas of scientific and technological application which the funds would be used to support. Also in response to this issue the United States recommended that developing countries take steps to increase their capacity to absorb and use science and technology effectively before seeking

any more funding for new science and technology projects.

The United States also objected to the formula used to calcuate contributions that should be made from developed to developing countries, saying that the "automaticity" involved was based on shaky economic premises.

VII. SUBSTANTIVE INITIATIVES THAT MIGHT BE DISCUSSED AT THE UNCSTD BY THE U.S. DELEGATION

The Department of State is now preparing short issue papers on substantive initiatives which it might bring up at UNCSTD in specific areas of scientific and technological cooperation. (See Section IX.) These initiatives probably will include proposals for increased international collaborative research and development, and expanded Federal agency efforts in scientific areas of relevance to the developing countries, such as in food and energy.

The UNCSTD Coordinator's Office at the Department of State has been seeking for about two years to identify substantive initiatives to offer at UNCSTD. But apparently agreement has been thwarted since relevant decisionmakers --- Federal agencies, Interagency Study Groups established to aid the Coordinator's Office, and Presidential advisors --- have not been able to reach consensus. A Presidential Review Committee meeting is scheduled for July 23 to select a firm list of U.S. policy initiatives for UNCSTD. The list probably will not be made public until the Vienna meeting. It is expected to be small and well-targeted, since Federal funds are scarce for new initiatives and agencies do not seem eager to identify and implement extensive new foreign programming given the recessionary climate facing the U.S. economy.

Many of the substantive initiatives that could be discussed by the United States could be based on the National Research Council study, entitled U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference, prepared by an eminent group of scientists, engineers, and business executives for the State Department. However, Federal budget constraints would undoubtedly prevent the Government from achieving the goals specified in the report. (See the Appendix for a summary.)

Although we do not know yet precisely what substantive initiatives the U.S. Delegation to UNCSTD might stress, the following are illustrative items for a "wishlist" of programs in science, technology, and development that might be emphasized as U.S. initiatives for UNCSTD, if funds were available to support them. They are suggested by a variety of Federal agency working documents that have been prepared over the history of the preparatory period for UNCSTD.

A. DESERTIFICATION, DEFORESTATION, AND SOIL DETERIORATION

1. High priority might be given to developing local and national integrated soil and forest management including training of both technical cadre and mid-level management personnel. Wherever possible, the appropriate international organizations, donor countries and private groups might be encouraged to cooperate to ensure necessary training facilities and technology to support

an effective soil management program especially in those countries most impacted.

2. Programs dealing with land management might be related to associated problems such as animal husbandry, water control and irrigation, meteorology, demographics, energy systems, and social patterns.

3. Programs and local capabilities might be supported to encourage the growth of technological self-reliance so that scientific knowledge and existing technology can be adapted to local conditions.

4. Since many of these problems go beyond national boundaries, governments might support regional cooperation such as that being undertaken in the Sahel and more recently between Mexico and the United States. Such regional cooperatives could be assisted by donor countries, the U.N. Environment Program, the Food and Agriculture Organization, the U.N. Development Fund, the World Bank and other such institutions.

5. Accelerated support might be given to advanced remote sensing technologies which could possibly help developing countries manage their natural resources. The development of training programs might aid user nations in interpreting and analyzing raw data and in relating such information to management decisions.

6. Specific recommendations of the Global Plan of Action approved by the U.N. Conference on Desertification might be reviewed within the U.N. System to ensure adequate follow-up, and if possible, accelerated attention and action.

B. WATER AND SANITATION

1. Countries could cooperate with a view to accelerating the provision of clean domestic water and sanitation facilities for the world's poorest people. To this end accelerated research and development as well as model or experimental programs might focus on the following technologies:

- Well drilling machinery techniques and maintenance especially for developing countries' needs,

- Hydrology and geology to locate clean water sources and their most efficacious extraction methods,

- Water pumps, both manual and via mechanized energy sources, which are low in cost, easily maintained, and can be manufactured by local industry, and

- Sanitation services and equipment including both managerial and technical skills.

2. In addition, local village level cadre could be trained in the maintenance of domestic water equipment and supplies and in sanitation and basic hygiene. This could include the teaching of basic hygiene to village community leaders, family heads, mothers, and school children through the use of already existing community institutions. The effort could be integrated with the provision of basic health care services.

C. HUMAN HEALTH

1. Delivery of primary health care. Nations might encourage and support expanded programs -- bilateral and through international collaboration -- to test and demonstrate large-scale systems for low-cost delivery of primary health, nutrition, and family planning services to whole populations, and to do backup research. Emphasis

could be on preventive services, relatively simple technology, and extensive use of paraprofessionals.

2. In support of the World Health Organization's (WHO), priority program of an accelerated immunization program, further research and development might be undertaken to provide low cost, relatively stable and efficacious multiple antigen vaccines and the means of their delivery, to immunize against the most common childhood diseases for which protection is available. In this connection, further development, research, and training might be done on low cost and low maintenance injection technology as well as support for supplies and quality control. These efforts could probably underpin the goal of providing immunizations to almost all of the world's children by the end of the Century.

3. Accelerated efforts might be undertaken in tropical diseases dealing with both their prevention and cure. In particular, schistosomiasis and malaria vaccines or other appropriate medicines might be given priority. Fundamental research into disease vectors, control techniques and experimental programs could be undertaken with the cooperation of developed and developing countries and through programs supported by WHO.

4. The WHO's information and alert system probably could be strengthened to ensure early warning against epidemics.

5. New environmental health problems might be given priority attention especially toxic chemicals as they impact on human health.

D. ENERGY

1. National and international organizations might award technical assistance to the developing countries to aid them in dealing with their own energy problems. Such funding might be used to undertake comprehensive energy resource assessment which might identify their energy resources, determine current and future energy demand, identify the technology needed and ascertain its costs and availability. Such assessments might enable developing countries to construct alternative energy strategies for an undertrained energy market.

2. Also relevant might be the development of an energy technology training and technical infrastructure on the national and regional level. This applies to the development of technological and managerial capabilities for indigenous and renewable energy sources. The United States might consider support.

3. To support and strengthen developing country overall capability and to share know-how and experience, support might be given to the expansion and establishment of regional renewable and non-conventional energy centers which might provide broad based technical training as well as research and development capabilities that might play a significant role in accelerating the introduction of cost/effective and indigenous energy sources to be substituted for costly imported fossil fuels. Donor countries, international organizations, and private foundations and the developing countries probably could cooperate to expand and/or create such new and renewable regional energy institutes.

4. Examination might be made of using the World Bank and the regional development banks for energy projects. Increasingly, funds probably will be needed for projects which support indigenous renewable or nonconventional resources.

5. Cooperation and collaboration between developed and developing countries for the purpose of familiarization and studies on practical application of renewable energy technology probably could be accelerated. This is especially the case in such areas as improved solar, wind, geothermal and hydro technologies.

6. The forthcoming U.N. Conference on New and Renewable Energy in 1981 might provide a significant focus for discussions on the acceleration of the introduction of these technologies on a worldwide basis. Such technologies probably can also decrease environmental risks which the world might experience through poor management in the development and use of energy resources.

E. POPULATION

1. Increased resources from both developed and less developed countries might be devoted to population programs which might reduce rates of fertility and provide choices to individuals with respect to family size. Particular attention could be given to the training of paramedics and auxiliaries in information, education, and motivation techniques as well as simple clinical skills associated with family planning services. Wherever possible such family planning activities might be integrated into community based comprehensive health delivery systems or in other local institutions that already play a significant role in community life.

2. With the improvement in techniques for safe and low cost surgical sterilization, this alternative has become possible for some countries. More emphasis might be placed on improving these techniques and their availability for both men and women in countries where it might assist population programs. Such voluntary surgical contraception could be provided as an alterntive to other family planning methods.

3. Special support might be given to the U.N. Fund for Population Activities in developing programs which contribute to better techniques for family planning as well as basic research and development in the population field including demographics.

4. Support might also be given to nogovernmental organizations working in the population field, who might provide modern techniques and training to the poorer countries. The expanded use of modern communications facilities in particular, community radio and television programs, could probably be strengthened both through private and governmental efforts.

5. The results of existing family planning research and development could, whenever possible, probably be provided to the developing countries as soon as possible. Existing research in the field might be focused on the problems and needs of the poorer countries whenever possible.

F. RESOURCES AND POLLUTION OF THE MARINE ENVIRONMENT

1. Significant increases in global scientific research into the estuarine and marine environment and into the behavior and well-being of its resources could be undertaken. Cooperation among coastal

and researching states probably is needed to encourage and to improve the quantity and quality of knowledge we have of the ocean resources on a worldwide basis. It seems useful for such scientific research to proceed as freely as possible and to be shared within the worldwide scientific communities.

2. New programs of conservation and management might be developed by coastal states to insure the maximum sustainable yield and the balance of the ecological system.

3. Cooperation in this areas between developing countries and countries with advanced technology probably could be encouraged and accelerated to halt pollution. The know-how in this area probably could be shared whenever possible between developed and developing countries through international organizations. Encouragement might be given to multilateral efforts since, in many cases multilateral cooperation can provide the most efficient approach to dealing with these environmental problems.

4. Support might be given to the U.N. Envirionment Program's (UNEP), Earthwatch/GEMs program of monitoring and assessing the global environment and in particular ocean ecology through the use of advanced technology and know-how.

5. Special training programs might be established or expanded for developing country personnel in the areas of marine scientific research, marine ecology, living and non-living resources management, conservation, and aquaculture.

G. AIR AND UPPER ATMOSPHERE POLLUTION AND CLIMATE CHANGE

1. It seems necessary for governments to work together to examine methods and techniques to assess environmental hazards and develop international as well as national programs for abatement of pollution and to deal with its possible and unavoidable consequences. Emphasis therefore might be given to the World Climate Program which is directed towards the beginning of research, data gathering, and assessment of climate change.

2. The acceleration and rapid development of UNEP's monitoring and assessment program called "Earthwatch" might provide an important tool to deal with these serious problems on an international basis. National programs and capabilities might be integrated into this global program and could play a vital role in assessing dangers and in preventing them. The United States might encourage the newly created UNEP working group on "Earthwatch" in its assessment of the global environment. To this end, relevant research and development undertaken in some countries might be of assistance to other countries in both monitoring and assessing pollution problems. Nations might cooperate in the exchange of know-how and technology to ensure early uses of the most effective new technologies. Such an exchange of information between the developed and developing world in how to deal with pollution problems might lower costs and significantly improve human health.

3. Early assessment of the long-run impact of the increase of CO_2 in the atmosphere might be a priority task of the appropriate international organizations and nongovernmental scientific groups.

4. Special training programs might be developed to assist developing country personnel to manage local and national pollution problems espcially those with a transboundary or health impact.

H. FOOD

1. Nations might reassess and strengthen their agricultural policies, strategies and programs with a view to achieving the targets established by the World Food Conference. Specific attention might be paid to ensuring a strengthening and more effective utilization of national and international scientific and technlogical ccapabilities to support these efforts.

2. High priority might be assigned by national governments and international financial institutions to the enormous capital investment needs in the agricultural sector of the developing world, particularly in the areas of fertilizer production, irrigation, and transportation infrastructure.

3. Governments and international organizations might recognize and address the emerging threat of degradation of the agricultural resource base (soil, water, vegetation) as a critical new dimension of the world food problem, and make the necessary investments to ensure its protection and long-term viability.

4. Support for research and development might be increased to: enhance agricultural production, particularly under tropical conditions; develop new food crops; breed greater adaptabilty and resiliancy into traditional food crops; improve food storage and preservation technologies; find economic alternative energy sources for agricultural

purposes; reclaim deteriorated arable land: and develop technological "packages" for small farmers.

5. Governments might renew and strengthen their commitments to international institutions dedicated to expanded food production, including the International Fund for Agricultural Development and the various International Agricultual Research Centers.

6. Increased attention might be paid to the design, integration and efficient operation of national food distribution systems, including feeder roads, highways, railways and ports, especially to serve rural areas and during times of famine.

7. The World Climate Program, coordinated by the World Meterological Oraganization, might be modified to include a coherent component dedicated to assessing the impact of perceived and possible climate change on world agricultural production.

8. Greater use might be made by governments of earth resources and weather satellite capabilities for anticipating crop yields, land use and degradation patterns and agro-meteorological conditions; developed nations and international organizations might intensify research and development on the application of this technology.

9. Governments and international organizations might collaborate in the design and pursuit of broadly based rural development plans which address and integrate agricultrual production within a broader framework with such other components as health, nutrition, and family planning services, and energy supply.

VIII. CONGRESSIONAL ACTION ON UNCSTD

Congressional attention to UNCSTD has included holding special seminars and hearings to identify issues and opportunities for the United States for UNCSTD, the passage of several types of legislation regarding the conference, including endorsement of "appropriate technology" as a major element of U.S. policy, special funding for Conference preparations, and statements endorsing general conference objectives. Some of these actions were taken in support of aiding the State Department in preparing for the Conference and some were undertaken in connection with legislation introduced to create an Institute for Scientific and Technological Cooperation, a major U.S. intitiative for the Conference. Records of the seminars and hearings may well serve as instructive background for those Members of Congress who will attend the UNCSTD meeting as part of the official congressional delegation. Congressional activities are summarized next.

A. CRS SEMINAR ON UNCSTD

An opportunity for interchange between executive branch officials, representatives from industry, labor and the scientific community, with members of Congress, staff from all committees with jurisdiction for Conference activities, and staff from relevant congressional support agencies, the Congressional Research Service (CRS), the Office of Technology Assessment, and the General Accounting Office, was provided at a CRS seminar on UNCSTD, held in November 1977. The seminar dialogue reemphasized the necessity, for those responsible for planning for the Conference, to involve in advance of the meeting, all segements of the public and private whose cooperation

is needed to insure that U.S. policy positions agreed on with respect to foreign assistance to the LDCs would be translated into acceptable policy actions.

B. SENATE HEARINGS ON UNCSTD

On December 15, 1977 the Subcommittee on Science, Technology, and Space of the Senate Committee on Commerce, Science and Transportation held a full day hearing on the UNCSTD. Chaired by Senator Adlai Stevenson III, the lead witnesses were Undersecretary of State for Security Assistance, Science, and Technology, the Hon. Lucy Wilson Benson, Ambassador Hesburgh, and Ambassador Wilkowski, each of whom testified on the current status of U.S. preparatory efforts. Other witnesses included Dr. Frederick Seitz and Mr. Rodney Nichols of Rockefeller University (who have served as members of the official U.S. delegation to some of the "prepcoms"), Mr. Benjamin Sharman, representing a labor viewpoint, from the International Association of Machinists and Aerospace Workers; Dr. William Carey, Executive Officer of the American Association for the Advancement of Science; Dr. Guyford Stever, Chairman of the Task Force on the National Paper; Dr. Harvey Averch, Assistant Director, Directorate for Scientific Technological, and International Affairs, National Science Foundation: Mr. Paxton Dunner, Chief Economist, U.S. Council, International Chamber of Commerce: Mr. Harvey Wallender, Vice President, Council of the Americas; Mr. Marcus Finnegan, Senior Partner, Finnegan, Henderson, Farrabow and Garrett; Dr. Robert Stein, International Institute for Environment and Development, and Mr. William Ellis, Coordinator for the Transnational Network for Appropriate/Alternative Technologies

(TRANET).

The hearings summed up the status of preparatory activity as of the end of 1977. The testimony indicated the range of issues that has emerged during the early preparatory activity, issues which still dominate the debates surrounding identification of acceptable components of U.S. policy toward the LDCs and an appropriate international strategy for development of the LDCs.

Some of the issues raised at the hearings were as follows:

> Is the United Stated obligated to respond to the demands for a New International Economic Order? To what extent should this country feel it has an obligation to respond to each of the specific demands raised in the Manila Declaration, especially to the controversial demand for a mandatory code of conduct for technology transfer?
>
> What is the best institutional response for any increased U.S. transfer to the LDCs? Should such assistance programs such as AID be on a bilateral or multilateral basis or both? If the former, can the U.S. effort be handled through existing assistance programs such as AID, or is there a need for a new agency? If the latter, what agency will play the lead role in coordinating an effort under the U.N. auspices?
>
> Should the major responsibility for technology transfer continue to be held by the private sector? The LDCs seem to feel that technology transfered by the private sector is superior to that by the public sector. But many LDCs assume, wrongly, that governments of developed countries control research, development and application within their borders and can control operations of multinational firms abroad.
>
> Many sectors of American labor view technology transfer provisions that might emerge from the Conference as a threat to the U.S. technological position and labor force employment situation. They fear that by enabling the LDCs to share our technology without allowing sufficient lead time to develop new technology, and by creating competitive job markets, U.S. labor will be adversely affected.
>
> What is "appropriate" or intermediate technology? Is small-scale, labor intensive technology more suitable to

the LDCs than large-scale, capital-intensive technology and should intermediate technology be stressed in the U.S. Conference position and its aid program? If so, how will policymakers react to many LDCs, opposed to "appropriate technology," who fear that the developed nations are pushing it to prevent all LDCs from sharing in the benefits of industrialization?

Should the initial thrust of U.S. policy for UNCSTD be towards meeting such basic human needs as food, population control, housing, and health care, or should it focus on the requisites for building up economic, as well as scientific and technological infrastructures or on promoting rapid industrialization?

How many and which international assistance programs are currently in existence in the United States that might be restructured or broadened to meet the needs of increased U.S. assistance to the LDCs? 1/

C. HOUSE SEMINAR ON UNCSTD

The House Committees on International Relations and Science and Technology jointly sponsored a three-day seminar on the UNCSTD on February 13, 14, and 15, 1979. The purpose of the seminars was to acquaint Members of Congress with the issues to be discussed at UNCSTD and to review the Administration's preparations and policies for the Conference. The seminars focused on two main issues: the need of developing countries to enhance their own science and technology base and the need of these countries to improve their access to the technological know-how of the developed countries.

1/ U.S. Congress. Senate. Committee on Commerce, Science and Transportation. Subcommittee on Science, Technology, and Space. U.S. Preparations for the 1979 Conference on Science and Technology for Development. Hearings, 95th Congress, 1st session. Dec. 15, 1977. Washington, U.S. Govt. Print. Off., 1978. 280 p.

The seminars provided a forum to consider the three goals which the U.S. Government envisions for debate and negotiation during the Conference: how science and technology may be used in meeting basic human needs in the developing countries; advancing the economic growth of developing countries; and dealing more effectively with global pressures on food and water, energy resources, raw materials, the environment, and with population growth.

The first session dealt with "transfer of technology and the role of multinational corporations." The main presentation was given by Jack Behrman, University of North Carolina. Discussants included Ben Sharman, International Association of Machinists and Aerospace Workers, and Harvey Wallender, Council of the Americas. The second session focused on the role of science and technology in promoting development and basic human needs. It also dealt with the issue of creating a new funding and aid mechanism in the United States to promote technological cooperation with the "post-AID graduate" countries. Previously called the Foundation for International Technological Cooperation (FITC), the proposed new institution is now called the Institute for Scientific and Technological Cooperation. The main presentation was given by Ralph Smuckler, chairman of the Development Coordination Committee and head of the FITC planning Office. Discussants included William Carey, American Association for the Advancement of Science and Ted Owns, of Appropriate Technology, International, a firm established pursuant to congressional directive to strengthen public and private appropriate technology initiatives.

The third session was titled "U.S. policy toward UNCSTD (including the role of UNCSTD in the North/South Dialogue)." Ambassador Jean Wilkowski gave the main presentation. James Grant of the Overseas Development Council was a main discussant. He also described some steps developing countries themselves were taking to promote sharing of technical information and development experiences. Other discussants during the three meetings were: Charles Meissner, Department of State, Charles Dennison, Council on Science and Technology for Development; Joel Bernstein, National Academy of Sciences; Charles Weiss of the World Bank; Peter Henriot of the Center for Concern; and Walter Hahn of the Congressional Research Service.

During a closed luncheon session, the comittee members were briefed by Father Hesburgh, Chairman of the U.S. Delegation to UNCSTD.

D. JOINT SENATE/HOUSE HEARINGS

A hearing was be held on July 17, 1979, conducted jointly by the Senate Subcommittee on Science, Technology, and Space of the Senate Committee on Commerce, Science and Transportation and the House Subcommittee on Science, Research, and Technology of the House Committee on Science and Technology on "U.S. Policies and Initiatives for the U.N. Conference on Science and Technology for Development." Senator Adlai E. Stevenson and Congressman George E. Brown presided. Witnesses included representatives from the Office of Science and Technology Policy and the State Department, testifying on the results of U.S. preparations for the Conference; and a panel of U.S. industry, labor and nongovernmental organization respresentatives who presented their views on proposed U.S. policies for the Conference.

E. LEGISLATION PASSED AND OTHER CONGRESSIONAL ACTION RELATING TO THE CONFERENCE

1. Directive to Emphasize Light Capital Technology

Section 507 of the Foreign Relations Authorization Appropriations Act of 1978, P.L. 95-105 (H.R. 6689), signed by the President on August 17, 1977, requires that the President insure that emphasis be given to light capital technology in defining the U.S. position for the U.N. Conference on Science and Technology for Development. Representative Clarence Long was the original sponsor of the section (H.R. 6689). The bill was introduced on April 27, 1977. The House Committee on International Relations Reported the bill on April 29. House passage with amendments, followed on May 4. A Senate measure, amended, was passed on June 16, 1977. Conference reports were issued on July 28, in the Senate and on August 3 in the House. The President signed the bill on August 17, 1977.

Subsequently Congressman Long, in his capacity as Chairman of the Subcommittee on Foreign Operations, House Committee on Appropriations asked the General Accounting Office to undertake a study of how the executive branch was complying with the need to emphasize "light capital technology" in conference preparations. The report has not yet been released.

2. Legislation to Authorize NSF Funding

The Congress also passed legislation in 1977 authorizing the National Science Foundation $1.2 million in funding requested for the fiscal year 1978 for UNCSTD preparations. (Authorized in the Senate report on S.855, National Science Foundation Authorization

Act of 1978, (Senate Report 95-93, p. 18.)) Subsequently funds were appropriated.

3. Legislation Endorsing Conference Objectives

Legislation endorsing the conference and authorizing about $1 million to the Department of State for Conference preparations is found in section 103 of the Foreign Relations Authorization Act for 1979 (P.L. 95-426). Specifically, the statute emphasized the importance of the Conference and that the U.S. delegation to UNCSTD should promote science and technology cooperation between developing and developed nations. This language was included as Section 420 of S. 3076, which passed the Senate on June 29, 1978. The proposal was considered as an amendment introduced by Senator McGovern. The Senate bill was substituted for the House bill, H.R. 12598, which did not have similar language, but which authorized $945,000 for UNCSTD activities. The House and Senate versions were included in the Conference report (H. Rept. 95-1535). According to one of several news reports, the funding authorization was included because some members felt that UNCSTD preparations were being jeopardized since they were competing with other U.N. conferences for scarce Department of State funds for international meetings. Both Houses agreed to the conference report and the Act became public law on October 7, 1978. It reads as follows:

> Sec. 103 (a) The Congress finds that ---
>
> (1) science and technology are keys to eradicating hunger and poverty in developing countries;
>
> (2) the ability of the developing countries to achieve self-sustaining growth has been hindered by lack of an indigenous scientific and technological base;

(3) this scientific and technological base is vital to the emergence of developing countries as full and equal partners in the international system;

(4) expanded cooperation with respect to science and technology can significantly contribute to an improved North-South relationship and

(5) the United Nations Conference on Science and Technology for Development offers a valuable forum for the analysis of problems of development that might be alleviated or solved with the aid of scientific and technical expertise.

(b) It is therefore the sense of the Congress that the United States should strongly support the purpose of the United Nations Conference on Science and Technology for Development and that the United States delegation to this conference should actively develop and offer proposals which would faciliate an expansion of mutually beneficial cooperation among developed and developing countries with respect to science and technology, including joint education and research and development programs.

(c) [$945,000 is authorized to be appropriated for UNCSTD preparations.]

The funds authorized to be appropriated specifically for the Conference were not included in the bill appropriating funds for the State Department for the fiscal year 1979, that was passed in 1978, P.L. 95-431. The bill appropriating such funds, H.R. 12934, was introduced on June 1, 1978, and reported from the Committee on Appropriations on the same day (H. Rept. 95-1253). The bill did not contain any special funding for the UNCSTD. In the words of the report, the Committee said it endorsed participation in the Conference, but expected funding for preparations and for emphasis to be given to light capital technology (pursuant to Sec. 507 of the Foreign Relations Authorization Appropriations Act for FY 1978) to come from the normal funds appropriated for salaries and expenses.

The measure passed the House by roll call vote on June 14 and was referred to the Senate Committee on Appropriations on June 19, 1978. The Senate Appropriations Committee approved the bill, amended on July 26, 1978, but did not add provisions for UNCSTD funding, (S. Rept. 95-1043). The Senate passed the bill, amended, on August 7. After approval of the Conference report the President signed the bill into law (P.L. 95-431) on October 10, 1978.

4. Proposed Institute for Scientific and Technological Cooperation

Administration efforts to develop an Institute for Scientific and Technological Cooperation (ISTC) have been underway for about two years. The proposed Institute would promote enhanced cooperation between the United States and developing countries in conducting scientific and technological research to hasten economic growth and development. According to some proponents, the proposal constitutes an effort by the Administration to design and implement a new concerted policy to couple science and technology with development assistance, a neglected aspect of foreign policy to date. The bills receiving congressional action would create the institute as a semi-autonomous part of the new International Development Cooperation Administration. The ISTC would receive $25 million in new funding and an additional $66 million in funds transferred from AID's bilateral aid program.

The topic of creating of the Institute was discussed at the joint House Committee seminar on UNCSTD held in February 1979, and at the joint House/Senate hearing held on July 17, 1979. Considerable attention has been given to the ISTC since it is intended to be a major Administration initiative for UNCSTD and

and it is a crucial component, according to some observers, of the new International Development Cooperation Administration.

Hearings on the Administration bill and on congressional versions of the bills introduced by Senator Adlai Stevenson and Rep. George Brown (who proposed an Institute more independent than proposed by the President) were held by the House Committee on Foreign Affairs on March 14 and the Senate Committee on Foreign Relations on March 15. A compromise version was passed in the House on April 10, 1979 (H.R. 3324).

Hearings were held on April 24 on the Stevenson bill (S.499) by the Subcommittee on Energy, Nuclear Proliferation and Federal Services of the Senate Committee on Governmental Affairs. This bill, slightly amended, was favorably reported, as was the Administration bill (S.588).

During debate, the Senate adopted an amendment to S.588, to eliminate Title II, creating the Institute. Senator Pete V. DeConcini who introduced the amendment, objected to possible duplication between ISTC and AID, the need to avoid excessive new Federal foreign assistance expenditures, and the need to overcome management and administrative problems in AID before transferring some of its personnel and funding to a new agency. The amendment was adopted on a roll-call vote of 58-42. The Senate substituted its amended version of S. 588 for the House passed bill, H.R. 3324. A conference is scheduled for July 24, 1979.

5. Other Legislative Actions

Several other types of congressional action have been taken to strengthen executive branch preparations for the conference or to persuade decisionmakers to endorse particular policy initiatives.

a. Letter to the President from Chairman Olin E. Teague

Former Chairman Olin E. Teague of the House Science and Technology Committee sent a letter on May 11, 1978, to President Carter soliciting information regarding planning for the Conference and requesting review at the presidential level. On June 30, the Assistant Secretary for Congressional Relations replied instead of the President. The response emphasized that the proposed Foundation for International Technological Cooperation would serve as a cornerstone for U.S. policies relating to the UNCSTD. When answering questions about attention to be given at the highest levels in formulating U.S. policies for the meeting, the response referred to a forthcoming meeting between the President and State Department officials concerned with the Conference. It also referred to the utility of an interagency policy review which was to have been finished in mid-February 1978, but which is still unfinished. This presumably is PRM 33. (See section IX. E 1.)

b. Correspondence Between Senator Charles Percy and Ambassador Wilkowski

Also, at his instigation, Senator Charles Percy exchanged with Ambassador Wilkowski correspondence about UNCSTD, as printed in the Congressional Record of July 11, 1978. In response to the Senator's questions, Ambassador Wilkowski described efforts being made in her

office or by researchers affiliated with the Conference to meet the Senator's concerns for appropriate technology and for technology transfer. Ambassador Wilkowski also indicated that LDCs are not enthusiastically supportive of stressing appropriate technology in the Conference, as endorsed by the U.S. Congress in P.L. 95-105. She reasoned that "U.N. planners for the Conference are trying to eschew use of the term 'appropriate technology' in favor of 'choice of technology.' There is much sensitivity in some countries as to who says a technology is appropriate; also both high technology and low technology are considered appropriate, depending upon local circumstances in [a] developing country's economic and social goals." 1/

c. Congressional Delegates

The following House Members have ben appointed or announced as members of the congressional delegation to UNCSTD: Don Fuqua, Robert A. Roe, James H. Scheuer, Larry Winn, Jr., Tom Harkin, George E. Brown, Jr., Mike McCormack, Harold Hollenbeck, Jerome A. Ambro, Harold L. Volkner, Clement J. Zablocki, Dante B. Fascell, Johnathan B. Bingham, Dan Mica, Howard Wolpe, Floyd J. Fithian, James J. Blanchard, Donald J. Pease, Kent Hance, William S. Broomfield, John W. Wydler, and Robert J. Lagomarsino. Senator Adlai E. Stevenson has been appointed a member from the Senate.

1/ Congressional Record, July 11, 1978.

IX. FEDERAL GOVERNMENT PREPARATIONS FOR THE U.N. CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

A. REACTION IN 1975 AND 1976 TO CALLS FOR AN UNCSTD

U.S. Government preparations for the UNCSTD were initiated, in effect, by Secretary of State Henry Kissinger, during a speech delivered (by Ambassador Daniel Patrick Moynihan) to the Seventh Special Session of the U.N. General Assembly, September 1, 1975. During the speech the Secretary of State announced official U.S. support of the Conference. This speech, at least in the minds of some observers, also signified that the United States was planning to take some of the concerns of the Group of 77 seriously. Programs and policies of development assistance that the United States had used during the 1950s and 1960s had proven to be inadequate to meet the increasing challenges of nations wanting to share in the benefits of modernization and industrialization, the Secretary declared. In an attempt to meet some of the demands made in the declaration for a "New International Economic Order," U.S. assistance policy would take a new direction. During his speech Secretary Kissinger offered several concrete proposals for action. These proposals were reiterated in a speech Dr. Kissinger made at the Fourth Ministerial Meeting of the United Nations Conference on trade and Development (UNCTAD IV) held in Nairobi in May, 1976. Secretary Kissinger summarized these proposals made during 1975 and 1976 as follows:

> . . . We have proposed national and international institutes and programs to provide information, research, and training assistance to developing countries in science and technology.

> . . . [This] . . . includes information supporting the creation of an international center for the exchange of technological information; proposing the establishment of a technology exchange service for Latin America; proposing an inventory of United States national information sources and improved access to U.S. facilities; to support the concept of regional advisory services under UNCTAD auspices; and to support an offer to host the U.N. Conference on Science and Technology for Development....
>
> . . . [W]e have attempted to take steps to create an international environment in which the private sector, which is the repository of most of our technology, can make its maximum contribution. . . . We have increased our support for international agricultural research centers; proposed the establishment of an international energy institute; urged the establishment of an international industrialization institute; supported the creation of an inter-American technology center; and extended existing support for applied research in nutrition, health, and education.
>
> We have encouraged training by the encouragement of a formation of a technology corps and by proposing incentives and measures to curb emigration of highly-trained manpower from developing countries.
>
> With respect to encouraging the private sector, we have supported a voluntary code of conduct for the transfer of technology in UNCTAD. We have supported a voluntary code of conduct for transnational enterprises....We have proposed the establishment of an international resources bank. . . .
>
> We have supported the examination of restrictive business practices and recommended that other OECD nations urgently study the possibility of the greater contribution of all industrial nations to the problems of technology transfer. 1/

"...These proposals...represented a major policy pronouncement by the U.S. Government to put a larger share of its technology at

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1/ Department of State. Edited transcript of U.S. National Meeting on Science and Technology for Development, Nov. 17, 1976, pp. 11-12, as quoted in House Committee on Foreign Affairs. United Nations Conference on Science and Technology for Development -- A Background Paper, op. cit., pp. 22-23.

at the disposal of developing nations," reports the February 1979 study of the House Foreign Affairs Committee, ". . . [but] virtually no implementation of these proposals occurred." 1/ Some private citizens as well as governmental officials continue to bring up programs enunciated in these statements in discussions relating to formulating an agenda for UNCSTD.

B. U.S. NATIONAL MEETING ON UNCSTD, NOVEMBER 1976

During his presentation to UNCTAD IV, Secretary Kissinger also announced that the United States would hold a National Conference on Science and Technology for Development, and also an earlier national meeting on UNCSTD in November 1976 to enlist the support and contributions of all sectors of U.S society. Between UNCTAD IV and November 1976, an Ad Hoc Planning Group attached to the Undersecretary of State for Economic Affairs started preparing for the national meeting.

The national meeting, held in November 1976 at the State Department, was intended to begin the dialogue the Government felt it needed to frame the issues and options to be discussed at the U.S. National Conference, tentatively scheduled for late 1978. Attendees included representatives from Congress and the executive branch, industry, universities, foundations, research institutes, private voluntary organizations, and labor unions. The participation of more than 700 persons at the meeting indicated widespread interest in UNCSTD; and the discussions illustrated the issues which would continue to confront and separate the interest groups and governmental officials dealing

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1/ United Nations Conference on Science and Technology for Development --- A Background Paper, op. cit.

with the application of science and technology to development. For example, representatives of labor unions questioned the wisdom of taking policy action to increase technology transferred abroad because they feared American workers would lose jobs when competing with foreign labor given a new capability to make products for sale in American markets. Opinions also differed about whether the Government should emphasize meeting "basic human needs" or promoting industrialization and technological growth.

The 1976 meeting was hosted by the Ford aministration during the transition period to the Carter administration. The Ad Hoc group which had planned the meeting submitted a report in January 1977 to an Intergency Working Group on Technology. The report consisted of a series of questions and issues which should be addressed in preparing for the national conference. The report also recommended that a U.S. Conference coordinator be named.

C. CREATION OF AN UNCSTD COORDINATOR'S OFFICE

State Department activities for UNCSTD did not begin again in earnest until the President named a coordinator and chairman of the U.S. delegation to the Conference. In May 1977 President Carter announced appointment of the Hon. Jean Wilkowski, a career diplomat, as Ambassador in charge of coordinating U.S. preparatory activities. (An appointment of a coordinator with the status of Ambassador had been one of the recommendations of the Ad Hoc Committee.) The President also nominated Reverend Theodore Hesburgh, President of Notre Dame University as Chairman of the U.S. delegation. After both officials were confirmed by the Senate in July, the Office

of the Coordinator was established. The Office is responsible at the policy level to the office of the Undersecretary of State for Security Assistance, Science, and Technology, (headed by Mrs. Lucy Wilson Benson). The Coordinator's office receives substantive support from the Bureau of Oceans and International Environmental and Scientific Affairs (OES), currently headed by Ambassador Thomas Pickering, and from the Bureau of International Organization Affairs. Other agencies have also supported UNCSTD preparation activities.

D. FUNCTIONS OF THE COORDINATOR'S OFFICE

The Office of the Coordinator has a small staff, with seven budgeted positions, comprised of the Coordinator, a deputy, four other officers, secretaries and student interns. About $3.5 million, estimated, has been obligated for UNCSTD preparatory activities for the fiscal years 1978 and 1979, as indicated in accounts prepared by the State Department. Direct State Department obligations total about $833,000. The Agency for International Development obligated about $1.1 million and the National Science Foundation obligated about $1.5 million. (See Table C.)

Several factors have forced the Coordinator's office to seek considerable assistance from the private sector and other governmental agencies in preparing for the UNCSTD. One is its small size, another is the relatively low status accorded to science and technology as a policy area in the Department of State, and a third is the fact that most national decisions critical to technology transfer with the LDCs are made by the private sector in the United States.

The major functions of the Coordinator's Office have been to prepare for the National Conference (which originally was scheduled for November 1978, but cancelled), write the U.S. national paper required by the UNCSTD Secretariat at the U.N., and orchestrate the numerous conferences, workshops and research reports being prepared for the Coordinator's Office as background in preparationfor framing U.S.policy options for the Conference for use at the five pre-conference "prepcoms" and for the August 1979 Confrence in Vienna.

1. The U.S. Steering Committee for UNCSTD

The Coordinator's Office was assisted in its work by the advice of a high-level "U.S. Steering Committee for the U.N. Conference on Science and Technology for Development," composed of senior public officials and distinguished private citizens.

The members of the Committee are: Ambassador Farther Theodore M. Hesburgh, Chairman of the U.S. delegation to UNCSTD; Hon. Lucy Wilson Benson, Undersecretary of State for Security Assistance, Science, and Technology, Dr. Lewis M. Branscomb, Vice President and Chief Scientist, IBM; Mr. William Carey, Executive Officer, American Association for the Advancement of Science; Mr. James Grant, President of the Overseas Development Council; Mr. Patrick E. Haggerty, Honorary Chairman and General Director, Texas Instruments; Mr. Lane Kirkland, Secretary-Treasurer, American Federation of Labor and Congress of Industrial Organizations, Hon. Anthony Lake, Director, Policy Planning Staff, Department of State; Hon. Charles William Maynes, Assistance Secretary of State for International Organization Affairs; Hon. Thomas R. Pickering, Assistant Secretary of State for Oceans and Environ-

mental and Scientific Affairs; Hon. Robert H. Nooter, Deputy Administrator, Agency for International Development; Dr. James Perkins, Chairman of the Board of the International Council for Educational Development; Hon. Frank Press, Science Adviser to the President, Dr. Frederick Seitz, President, Rockefeller University; Dr. Clifton R. Wharton, Jr., Chancellor, State University of New York; Dr. Jerome B. Wiesner, President, Massachusetts Institute of Technology, Hon. Jean Wilkowski, U.S. Coordinator for the UNCSTD; Dr. Sterling Wortman, Vice President, The Rockefeller Foundation; Dr. Robert D. Hormats, Deputy Assistant Secretary of State for Economic and Business Affairs.

The Steering Committee has met 8 times as follows: 1977: August 10; 1978: March 16, June 21, September 14, December 6; 1979: February 14, April 5, and June 7.

2. U.S. Delegation to UNCSTD

As of July 23, 1979, the U.S. Delegation to UNCSTD had not yet been named. However, since the delegation will consist of eminent private citizens as well as State Department officials, it is expected that many members of the Steering Committee will be part of the U.S. delegation.

Several members of the congressional delegation to UNCSTD have been announced. See Section VIII, 5. c. above.

E. LIAISON BETWEEN THE COORDINATOR'S OFFICE AND OTHER FEDERAL AGENCIES

In order to carry out its duties the Coordinator's Office established liaison with relevant government agencies, especially the National Science Foundation, the Agency for International Development and the Office of Science and Technology Policy in the Executive Office of the President, and with private groups of scientists, technologists, industrialists and development specialists.

1. Plans for a Presidential Review Memorandum on Science, Technology and Development

Liaison activities with other parts of the Government were formally initiated in February 1978, with the establishment of an Interagency Policy Group and several Interagency Study Groups to assist with U.S. preparations for UNCSTD.

A major task of the Interagency Policy Group has been to assist in formulating a Presidential Review Memorandum, numbered PRM 33, which is intended to survey and lay out options for the President to use in enunciating and implementing U.S. policies to deal with the North-South dialogue and especially relating to the U.N. Conference on Science and Technology for Development. The PRM was originally scheduled to be finished in early Summer 1978, but has not been finished as of early July 1979. 1/ The State Department does not know whether or not the the PRM will be

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1/ Interview with officials of the Dept. of State. June 17, 1979, and Office of Science and Technology Policy, July 6, 1979.

finished in time for use at UNCSTD. A Presidential Review Committee meeting was scheduled for July 23, to lay out firm U.S. policy options for possible presentation at the Conference. The delay in announcing firm objectives for the Conference caused some concern among members of Congress at the July 1979 hearings on UNCSTD.

The history of the PRM effort is as follows: In October 1978 the interagency group writing the PRM issued a "think piece" outlining alternative philosophical options which the United States could pursue in developing responses to the North-South dialogue. These included such alternatives as developing policies to transfer information and research capability for LDCs to conduct research relevant to development processes, versus developing policies do to the research in the United States and then transfer the results to the LDCs for application. Apparently Federal agencies were asked to take positions pro and con on such issues and incorporate their reactions into budget review processes for the fiscal year 1980. In February or March 1979 the interagency group writing the PRM summarized the Federal agency reactions. Apparently agencies did not reach consensus on science and technology transfer policies appropriate for the conference. 1/

1/ Idem.

2. Federal Agency Reviews of Development Assistance Oriented Programs Stimulated by the PRM Exercise

The major benefit of the PRM exercise, according to a State Department official, is that it forced agencies to review their science and technology development oriented programs and policies. Evidences of these reviews have been seen according to the same official, in speeches made by agency heads. The exercise has also caused agencies to look critically at responses they proposed to make to several recent nongovernmental reports which have recommended specific Federal actions to promote development, such as the food and nutrition report completed by the National Academy of Sciences. The objective has been to determine whether domestic mission agencies should take on more of the foreign development-oriented programs recommended in such reports, or whether AID (or ISTC) should enlarge responsibilities for programs in these areas. The reviews undertaken were also used on behalf of the interagency study groups survey of Federal programs relevant to the Conference. (See the next section.)

3. Inventories of Federal Agency Programs and Policies Relevant to UNCSTD Completed by Interagency Study Groups

Seven Interagency Study Groups, which reported to the Office of the Coordinator for the Conference, were formulated in February 1978. They were composed of agency officials and representatives of either the State Department or AID, and were organized and chaired by the lead agency for each of the seven subject areas. Interagency study groups and lead agencies were:

Table B

Interagency Study Groups Established to Support the Work of the Office of the Coordinator of U.S. Preparations for UNCSTD

Subject Area of Interagency Study Group	Lead Agency
Health, nutrition and population	Department of Health, Education and Welfare
Energy, natural resources and environment	Department of Energy, in conjunction with the Department of Interior and the Environmental Protection Agency
Food, soil, water and climate	Department of Agriculture
Industrialization and trade	Department of Commerce
Employment and manpower utilization	Department of Labor
Urbanization, transportation and communications	Department of Housing and Urban Development, in conjunction with the Department of Transportation and the National Aeronautics and Space Administration
Education and training for science and technology infrastructure	Department of Health, Education, and Welfare, in conjunction with the National Science Foundation

The Interagency Study Groups had two basic responsibilities. One was to assist the Coordinator's Office by making recommendations for U.S. initiatives and positions at the UNCSTD. Specifically:

> In addition to recommendations generated from its own ranks, the Study Groups will be asked to evaluate proposals made to the Office of the...Coordinator, including those contained in the very important background report being prepared by the National Research Council and the results of the FFME project. 1/

A second responsiblity was to survey ongoing U.S. programs "undertaken either directly or through support of private organizations, which have been designed or have important benefits for LDCs" in each of the seven subject areas delineated. The Coordinator's Office instructed that the survey should provide:

- a description of the program, including its purpose, its relation to light-capital technology, where operating, duration, and accomplishments (both successes and failures);
- a statement of the cost....;
- the planned future of the program (including funding); and
- identification of activities/programs which have been particularly effective or ineffective and particularly welcomed, or not welcomed by developing countries. 2/

a. Tabular survey results indexed by the National Science Foundation.

Apparently the survey resulted in the submission to the Coordinator's Office of seven volumes of abstracts of 341 U.S. Government programs. At the request of the Coordinator's Office, the National Science Foundation

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1/ Office of the U.S. Coordinator for the UN Conference on Science and Technology for Development. Interagency Study Groups. Organization and Responsiblities. Feb. 15, 1978.

2/ Ibid.

condensed the survey material into a one volume index of programs. The Foundation developed index categories conceptualized "to address the issues highlighted" by the second meeting of the UNCSTD "prepcom." Each program astract was coded into categories describing its principal thrust, the activity site, technology transfer components, and the funding source. NSF cautions that the reader should be aware of several caveats in interpreting the materials since agencies did not use the same criteria when submitting abstracts of program activities for analysis.

The Foundation computerized the results and also submitted an approximately 200 page hard-copy indexed version with short analyses of programs in each of the seven subject areas for use in two ways: preparation of final U.S. policy positions (for use by the Coordinator's Office and official delegates to the UNCSTD meeting) and distribution of the inventory at the Vienna UNCSTD meeting for the use of developing countries. (Indeed, NSF went so far as to list names and addresses of agency officials responsible for the programs.)

One of the most interesting results to emerge from the report is that 88 or about 1/4 of the programs identified are relevant to developing country needs but do not serve developing countries, for lack of funding or or agency mandate to promote international development. The report continues:

> They are functioning programs with technical competencies in areas which are critical to development, but operate domestically without a global mandate or budget to serve developing countries. As Quentin West, Chairman of the Study Group on food pointed out, the programs of domestic agencies are only indirectly related to the transfer of science and technology to developing countries.

West states that: "Given a mandate and proper focus, the enormous capacity indicated by the survey might be utilized to make a far greater impact on international development that at present." 1/

b. Analytical assessment of the survey

In an effort to enhance the utility of the interagency survey results, the Office of the Coordinator arranged for a staff member of the National Research Council to prepare an analytical review of many of the agency programs in science and technology affecting developing countries (in each of the seven program areas) and which can be applied to meeting UNCSTD objectives. The report will be annexed to the U.S. national paper and circulated at Vienna to all conference participants. 2/

F. U.S. PREPARATIONS FOR UNCSTD EMPHASIZE INCREASING OR INITIATING PROGRAMS TO APPLY SCIENCE AND TECHNOLOGY, DESPITE GROUP OF 77 DISINTEREST IN NEW PROGRAMMATIC INITIATIVES

Most of the developing countries have indicated during the "prepcoms" that they want UNCSTD to set in motion procedures to create new institutions and processes to redistribute ownership and control of science and technology. They have emphasized repeatedly that they are not interested in discussing specific applications of science and technology in particular development areas. They persist in stressing that such discussions should be deferred until after the financial and intergovernmental machinery desired by the

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1/ U.S. National Science Foundation. (Office of International Programs.) Index of U.S. Government Programs of Science and Technology relevant to Developing Countries. Non-dated, prepared in Dec. 1978?, p. 3.

2/ Interview with Simon Bourgin, Office of U.S. Coordinator, June 13, 1979. The draft of the report is titled: Using Science and Technology for Development: Some United States Programs. Prepared by Patricia W. Blair, in preparation, June 29, 1979.

Group of 77 to meet the science and technology goals of NIEO has been established.

Nevertheless, the United States is preparing to discuss or present initiatives for cooperative projects in specific applied science and technology areas. The analytical study of agency programs supportive of UNCSTD goals referred to immediately above is one effort in this direction. Several similar activities have been undertaken.

1. Thirty Programs Likely to be Stressed at UNCSTD

During May of 1979 the Coordinator's office, working closely with the the Bureau of International Oceans and Environmental and Scientific Affairs (OES) attempted to firm up a list of suggested program and policy initiatives that might be considered for UNCSTD for possible presentation at UNCSTD. The Office completed an informal review with other interested offices in State and AID of several lists (including the results of the Interagency Study Groups mentioned above and the National Research Council report which suggested programmatic initiatives in five areas). The list was winnowed to about 30 items on June 15, 1979. About 25 were recommended as possible fruitful initiatives. Background papers including data on existing and proposed programs and estimated funding needed for the fiscal years 1979, 1980 and 1981 were to be prepared. Although lead agencies were identified the Administration has not yet targeted programs which will receive major emphasis. Congressional and Administration budgetary restraints apparently have caused delays in decisionmaking.

Among the programs considered in early discussions were such initiatives as:

Institute for Scientific and Technological Cooperation in relation to UNCSTD

Tropical disease research

Remote sensing/agri-farming

Satellite communications

Post-harvest losses

Energy research

Geothermal sensing

Expansion of the existing SEED program (Scientists and Engineers for Development)

Regional satellite centers

Information systems

Crop/weather forecasting

Among other topics previously discussed were: agribusiness technology, world hunger, LDC graduate topping-Off, and engineering training. 1/

1/ U.S. Department of State. Office of the U.S. Coordinator for the U.N. Conference on Science and Technology for Development. Memo: Subject: U.S. Presentation at UNCSTD of Assistance Programs in Science and Technology, June 15, 1979.

The proposed position papers are separate from the other policy papers being prepared for the UNCSTD at the direction of Ambassador Wilkowski's office. See below, Section IX. I.

G. PREPARATION OF THE U.S. NATIONAL PAPER FOR UNCSTD

The U.S. national paper was prepared by a small group working under the direction of the Coordinator of the Conference. Reports indicate that the paper went through several drafts and was not finished in time to meet the original U.N. deadline of Aug. 1, 1978. It was originally anticipated that the national papers would be discussed at the "third prepcom," originally scheduled for Sept. 18-29, 1978. Delays in paper preparation caused a postponement of the meeting, which was rescheduled for Jan. 22 - Feb. 3, 1979. The official U.S. paper, entitled Science and Technology for Development, U.S. National Paper, was finished in time for this meeting. 1/

Some critics attributed the delay in preparation of the U.S. National Paper to difficulties policymakers encountered in trying to reach consensus among agencies in determining what U.S. policy should be and in writing PRM 33, the Presidential Review Memorandum planned

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1/ Science and Technology for Development. U.S. National Paper. United Nations Conference, 1979. Washington, U. S. Govt. Print. Off., Released Jan. 1979. 35 p. (Department of State Publication 8966, International Organization and Conference Series 139.)

to assist the President in developing a U.S. position for science, technology and development. Other critics have faulted the paper for not treating issues which the Group of 77 have identified as topics they want the UNCSTD to address.

1. Suggestions for Programmatic and Research Intiatives in Federal Agencies: Research Report Prepared by the National Research Council

Preparations for the national paper began in October 1977 when the Department of State awarded a contract (with funds supplied partially by the National Science Foundation) to the National Research Council (NRC) to identify "ways in which U.S. scientific and technological resources could better contribute to developing country needs." (The National Research Council is the research arm of the quasi-governmental National Academy of Sciences.) The NRC established an Executive Committee, chaired by Dr. H. Guyford Stever, former Science Advisor to the President and Director of the National Science Foundation. The Committee, in addition consisted of the chairmen of five panels which covered the various subject areas studied, the Foreign Secretaries of the National Academy of Sciences and the National Academy of Engineering, and the chairman of the Committee on International Health of the Institute of Medicine.

The work of the five panels was supplemented by suggestions heard at four public forums, held in mid-January 1978 in New York, Atlanta, St. Louis, and San Francisco, attended by about 400 participants, primarily representing civic, public interest and business organizations, and the academic community.

The resulting report, released in April 1978, entitled U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference,

recommends practical cooperative action, research, and institutional changes (in both the United States and the developing countries) to meet science and technology initiatives needed for development. 1/

Most of the recommendations in the study do not appear to be reflected in the national paper, perhaps because they required significantly larger Federal budgets for research and development or development assistance, and because the national paper was meant to reflect preliminary recommendations for the Conference, not detailed substantive initiatives. The NRC report recommends initiating or enlarging Federal agency, bilateral and multilateral cooperative S and T progams, improved data collection and sharing, expanded international collaboration, and training in the following areas:

- Increasing food supplies
    - Reducing postharvest food losses,
    - Soil and water management at the farm level,
    - Plant and animal protection, and
    - Overcoming biological limits to plant productivity.
- Health and related needs
    - Delivery of primary health care,
    - Pure water and waste treatment,
    - Controlling infectious diseases of the tropics, and
    - Improved contraceptives.
- Urbanization and industrialization
    - Improving urban settlements,
    - Planning transportation systems,
    - Building capabilities for creating and using industrial technology, and
    - International research on the industrialization process.

1/ U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference. Background Study on Suggested U.S. Inititatives for the U.N. Conference on Science and Technology for Development, Vienna, 1979. Prepared by the National Research Council. Printed by the Department of State. Washington, U.S. Govt. Print. Off., 1978. 212 p.

- Management of resources

    - Development and use of energy,
    - Remote sensing and other applications of satellite technology,
    - Sustained, multiple use of forest resources, and
    - Research on the marine environment.

- General initiatives

    - Strengthening scientific and technological policymaking,
    - Information sharing,
    - Education in the United States,
    - Short-term, nondegree training,
    - Continuing university interchange, and
    - Incentives for development-related research in the United States.

It remains to be seen how much the report will influence the position papers the Department of State is now having written on program intiatives the United States should pursue at UNCSTD. See the Appendix for a summary of the recommendations contained in the NRC report.

2. Industrial Views on UNSCTD: Study Prepared by a Consortium of the Fund for Multinational Management Education

Cognizant of the need to enlist the views and cooperation of the industrial sector in writing the U.S. national paper, the Office of the Coordinator (again with partial funding from the National Science Foundation) supported a research project undertaken by a consortium of the Fund for Multinational Management Education, the Council of the Americas, the United States Council of the International Chamber of Commerce, and the George Washington University for a project on "Transfer of Technology and the U.S. Private Sector." The project involved approximately 120 American business firms in a series of meetings and workshops held in eight cities throughout the country between September 1977 and March 1978. Individual case studies on technology transfer experiences in particular

industries, as well as other analytical papers and reports were also prepared.

The project dealt with four principal issues relating to the development and transfer of technology:

- United States legal, political, and economic constraints and incentives affecting technology transfers,

- Developing country legal, political, and economic constraints and incentives affecting technology transfer and development,

- Technical assistance programs of the United States Government and intergovernmental organizations, and

- Industry characteristics affecting the transfer of technology.

The report consisted of four volumes, one of which summarized the major findings and recommendations. Findings dealt primarily with the need to recognize that technology is critical to development, that industry will not operate in an developing country unless internationally agreed upon legal codes and regulations respecting the ownership of property are followed, that there is a need to revise certain domestic tax laws to improve the climate for investment and training abroad, and that industry has a role to play in creating appropriate capacities for developing countries to absorb imported technology and to develop indigenous technology. 1/

See the Appendix for a summary of the recommendations.

1/ Public Policy and Technology Transfer. Viewpoints of U.S. Business. Sponsored by Fund for Multinational Management Education, Council of the Americas, United States Council of the International Chamber of Commerce, and the George Washington University. Prepared under contract for the U.S. Department of State. Washington, March 1978, vol. 1. Overview and Policy Considerations, 59 p., vol. 2, Industry Characteristics, 761 p., vol. 3, Host Country Environments, 439 p., and vol. 4, U.S. Environment and Technical Assistance Programs, 515 p.

3. Other Research Reports

The two reports mentioned above were major studies prepared specifically to assist the Coordinator's Office in writing the U.S. national paper. In an effort to support the iterative formulation of a national position for the UNCSTD, the Coordinator's Office also supported several research projects and conferences during the end of 1978 and first few months of 1979 to assist in eliciting the views of others. Some projects received financial support from the National Science Foundation which received congressional approval for $1.2 million in funding for the fiscal year 1978 in support of UNCSTD activities. See Table C. These studies and findings were:

a. Corporate Views in Workshops of International Management and Development Institute

- A series of four workshops, managed by the International Management and Development Institute, were held in November 1978, to involve corporate leaders from the U.S. business community and representatives from the developing countries. Meeting for two days regionally, in New York, Chicago, Los Angeles, and Atlanta, businessmen discussed issues likely to emerge at UNCSTD which affect the operations of American business in dealing with developing countries. A final report was published as Science, Technology and Development, in January 1979. The report stressed the positive contributions that private enterprise can make to development (not the negative aspects such as those perceived of MNC operations.) It reiterated that private industry has a right to expect a return on investment of resources. Major recommendations included those of promoting technology transfer by using the skills and experiences of American businessmen to hasten the development of LDC managerial and technical manpower skills. 1/

1/ Chrisatensen, D.C. and Danelle K. Simonelli, eds. Science, Technology and Development. Final Report. Results of a Program Conducted by the International Management and Development Institute for the U.S. Department of State, as a Contribution to U.S. Preparations for the United Nations Conference on Science and Technology for Development. (Conclusions bassed on a questionnaire and a series of meetings held in the Fall of 1978.) Washington, D.C., International Management and Development Institute, January 1979. 72 p.

b. Appropriate Technology· The Winrock Meeting

- A four-day meeting on appropriate technology was held at the Winrock International Conference Center near Little Rock, Arkansas, from December 1 to 5, 1978, attended by some two dozen leading practitioners of appropriate technology in the United States and abroad. A series of recommendations were made to include appropriate technology considerations in U.S. policy for the UNCSTD. The substantive discussions of appropriate technology dealt with agriculture, ecosystems, small business, health, and food preservation. The group emphasized that appropriate technology is not old fashioned technology, ". . . it was in the advance not the rear guard of technological change, . . . it applied as much in developed countries as in developing. . . ."

See the appendix for a summary of recommendations made. 1/

c. Workshops and Reports Sponsored by the American Association for the Advancement of Science on: Labor, Women, Professional Societies, and Development of Indigenous Science and Technology Institutions

- In support of conference activities the Coordinator's Office awarded funding totaling $121,777 for four workshops and reports to the American Association for the Advancement of Science. The workshops which were held in March, April and May 1979, were intended to elicit information about various U.S. positions for UNCSTD and to stimulate a dialogue on Conference issues. Each report contains recommendations for policy actions to be taken by the government. Workshops dealt with the development concerns of organized labor, women, professional societies, and development of infrastructure and indigenous science and technology institutions.

The workshop on "Women and Development" concluded that giving priority to renewable resources to provide energy at the household level would be of most technical assistance to women in the developing world, and spent two days working on the infrastructure which would support that statement. Background papers included case studies on technology in problem areas such as: banking and credit, rural prosperity and poverty, land policy, and the role of nationally supported women's associations.

1/ Proceedings of a Workshop: Appropriate Technology. December 1-5, 1978. Winrock Inernational Conference Center, Arkansas. Funded by Office of the U.S. Coordinator, U.N. Conference on Science and Technology for Development. 39 p.

The participants at the workshop on "Building National Institutions for Science and Technology," stressed the need to strengthen and improve present institutions rather than create new ones. The importance of the exchange of scholars and the strengthening of engineering curricula were also mentioned as important factors. Seven background papers explored various aspects of the institution-building process and the role of MNCs.

Participants at the workshop on "Science and Technology for Development: Organized Labor's Concerns" discussed such topics as the impact on U.S. domestic employment of growing imports from and trade with the lessdeveloped countries, the role of MNCs, the adjustment of trade-displaced workers. It was noted that a slowdown of technology transfer to the LDCs would cut domestic job losses, and that the United States should investigate production-sharing ventures with firms in LDCs.

Four process-oriented workshops were addressed under a single umbrella heading: "The Role of Scientific and Engineering Societies in Development." These included: organizing R and D teams for applied research and development, use and dissemination of scientific and technological information, scientific and technological education and training, and ways to evaluate technology.

See the appendix for a summary of recommendations made. 1/

4. Research and Workshops Supported By Other Federal Agencies

In addition to NSF, research offices in State, AID, the Patent Office and in other Government agencies are supporting or conducting research. The Engineers Joint Council has been awarded funds by the Department of State to assist it by surveying members, many of

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1/ AAAS Workshop on Women and Development, Held March 26-27, 1979, Washington, D.C. Report of Recommendations. Prepared by Irene Tinker. 23 pages plus appendices (prepared papers and discussion.): Building National Institutions for Science and Technology in Developing Countries. Proceedings of a Workshop Held Under the Auspices of the American Association for the Advancement of Science, Apr. 18-19, 1979. Charles V. Kidd, Editor. 152 p. plus appendices; Report on AAAS-sponsored Workshop on Science and Technology for Development: Organized Labor's Concerns. Held on May 7-7,1979. By Joseph Mintzes, rapporteur. 27 p. plus appendices: The Role of Professional Scientific and Engineering Societies in Development, Held May 21-22, 1979, Washingvton, D.C. Jeannette Wedel, ed.

whom are foreigners from developing countries, but trained in this country, about solutions to the braindrain problem. 1/ The Council has also attempted to assist the Coordinator's Office by identifying some general engineering problems which engineers from both developed and developing countries could work on cooperatively. It has also conducted surveys to see how professional engineering societies can assist in development. In addition the National Bureau of Standards co-sponsored with AID a workshop in October 1977 on "The Technological Knowledge Base for Industrializing Countries," examining measurement capabilities, standards, quality control, and other knowledge required for developing commercial industrial technology. The workshop, geared specifically to support the UNCSTD, looked at the benefits derived from six years of a cooperative program between NBS and developing countries designed to improved standardization and measurement services. 2/

Also as part of its program of workshops held throughout the country to elicit views of relevant public sectors, the Department with AID funding, co-sponsored a workshop in July 1979 with the National Association of Land-Grant Collges and State Universities, held at Southern University in Baton Rouge, Louisiana. The Presidents of the "1890 land-grant institutions," which historically are Black, and which were created

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1/ Discussion with Lou Rudel, U.S. Department of State, June 1979.

2/ U.S. Department of Commerce. National Bureau of Standards. Standardization in Support of Development. NBS Special Publication 507. Washington, U.S. Govt. Print. Off., 1978.169 p.

by the 1890 statute, participated in the workshop on "The 1890 Land-Grant Institutions: A Unique Resource for Development." The meeting examined the experience of the Black colleges in technical and human development as a current resource for developing countries.

H. ROLE OF THE AGENCY FOR INTERNATIONAL DEVELOPMENT

The Agency for International Development has spent almost $1.1 million for conference preparations. See table C. In addition to its support to the Coordinator's Office for the various workshops and meetings already mentioned, AID undertook several special activities to examine the relevance of appropriate technology to U.S. policy for UNCSTD. Data in table C reflect that AID funding for appropriate technology activities totaled almost $300,000, or almost one-tenth of total conference preparation costs for the fiscal years 1978 and 1979. AID also completed an in-house survey of its programs supportive of the UNCSTD objectives. Many of these are described in a document AID prepared for the Coordinator's office (which is in draft form, but may be made available for members of the U.S. delegation). AID programs are also described extensively in the summary of the interagency analysis of Federal agency programs which are encompassed by the theme of "science, technology, and development." 1/

1/ Using Science and Technology for Development: Some United States Programs, op. cit.

I. CRITICAL ROLE PLAYED BY THE NATIONAL SCIENCE FOUNDATION

Among all Federal agencies, the National Science Foundation has been the most active and largest supporter of research for the Conference. During the fiscal year 1977, NSF allocated $100,000 to initiate preparations for UNCSTD. 1/ During 1977 the Congress passed legislation giving the Foundation $1.2 million for funding fiscal year 1978 UNCSTD activities. 2/ Actual expenditures for the fiscal year 1978 totaled $819,506, and the Foundation planned to spend about $544,494 for Conference preparation activities during the fiscal year 1979. 3/

Data arrayed in table C, indicate that of three agencies which have obligated funding for UNCSTD -- the Department of State, the Agency for International Development and the National Science Foundation -- NSF obligated the largest sum, $1,531,725, for the fiscal years 1978 and 1979.

1. NSF Extramural Research Support for UNCSTD

NSF supported both extramural and in-house research. An NSF program solicitation requesting proposals for research support for UNCSTD resulted in the award of six grants. The citations for resulting research reports and amount of funding are given next:

1/ NSF. Congressional Budget Presentation Document for Fiscal Year 1978, p. H-I-1.

2/ NSF. Congressional Budget Presentation Document for Fiscal Year 1979, p.H-I-1.

3/ NSF. Congressional Budgert Presentation Document for Fiscal Year 1980, p. F-I-1.

Table C

Schedule of Fiscal Year 1978 and of Fiscal Year 1979 Direct Costs (Obligations) for U.S. Preparations for the 1979 U.N. Conference on Science and Technology for Development, [Including Funds Budgeted for appropriate Technology] 1/
(* Indicates Funds for Appropriate Technology.)

	State Dept. Accounts		AID Accounts	NSF Accounts	Total
	General Accounts/ International Organizations Section	UNCSTD Coordinator's Office (T/CST)			
Fiscal Year 1978					
Salaries of 7 staff at State		$188,347			$188,347
Benefits of 7 staff at State		16,721			16,721
General operating costs for T/CST	74,800				74,800
National Academy of Sciences, National Research Council Report	393,400			[393,400]	393,400
FMME Workshop and Report	190,100			[190,100]	190,100
IMDI Workshop	77,000		[24,000]	[53,000]	77,000
AAAS Workshops and 5 Additional Studies	362,000 60,000*		[362,000] 60,000*		362,000
7 NSF Contracted Studies				264,525 65,916*	264,525
AID FY77 and FY78 Actions for UNCSTD			666,392 232,190*		666,392
Total FY 1978	1,097,300 1,302,368	205,068	666,392	264,425	2,233,285

1/ Provided by Mr. Jim Rafferty, Department of State, 7/79. Prepared by M. Abbott, 12/15/78.

Fiscal Year 1979 (Estimated)					
Salaries of 7 staff at State		212,902			212,902
Benefits of 7 staff at State		19,800			19,800
General operating costs for T/CST	150,000				150,000
I.O Conference Funds (est.)	200,000				200,000
NRC report (contract ext.)	105,200			[105,200]	105,200
NSF Funds (unobligated)				525,500	525,500
AID FY79 Active for UNCSTD			36,125		36,125
Total, FY 1979	455,200	232,702	36,125	525,500	1,249,527
	687,902				
Total All Fiscal Years	1,552,500	437,770	702,517	790,025	3,482,812
	1,990,270				
Total All Fiscal Years by Original $ Source	424,800	437,770	1,088,517	1,531,725	3,482,812
Amount directly Identifiable as Appropriate Technology			292,190	65,916	358,106

Table D

NSF Awards for Extramural Research on UNCSTD

Diwan, Romesh and Dennis Livingston. Development Strategies and Technological Choices in Developing Countries. Rensselaer Polytechnic Institute, Troy, New York, Sept. 30, 1978. 142 p. Amount of award $26,400.

Evans, Donald D. Award titled "Technology Transfer and Utilization in LDCs --- The Role of the U.S. Public Policy," University of Denver, Denver, Co. Amount of award $36,000.

Kidd, Charles V. Manpower Policies for the Use of Science and Technology in Development. A Background Paper for the United States Delegation to the U.N. Conference on Science and Technology for Development, Oct. 1978. Washington, Graduate Program in Science, Technology, and Public Policy, The George Washington University. Report: 255 p. plus appendix; Summary: 41 p. Amount of award $40,317.

Morgan, Robert P., et. al. The Role of U.S. Universities in Science and Technology for Development: Mechanisms and Policy Options. St. Louis, Center for Development Technology, Department of Technology and Human Affairs. Washington University, Sept. 1, 1978, 491 p. Amount of award $31,200.

Shapiro, Kenneth. Award titled "Science and Technology for Management of Fragile Environments in Developing Nations." University of Michigan. Amount of award: $53,092.

Stanley, Timothy W. Obstacles and Opportunities in Technology Utilization for Development. Washington, D.C., International Economic Studies Institute. Sept. 1, 1978, 238 p. Amount of award: $39,516.

NSF support has also gone directly to the Department of State in aid of several of the major conferences and studies it supported. These awards were as follows: 1/

$385,000 for the National Research Council study, U.S. Science and Technology for Development,

$53,000 for the study by the International Management and Development Institute, Science, Technology and Development, and

Two awards of $15,000 and of $153,000 for the study Public Policy and Technology Transfer: Viewpoints of U.S. Business, sponsored by the Fund for Multinational Management Education, et. al.

2. NSF In-house Research Support for UNCSTD

a. Index of Interagency Survey

The NSF has also undertaken at least two in-house research projects on behalf of the Coordinator's Office. One is the project already described to prepare a summary of U.S. Government programs relevant to the UNCSTD. The Division of International Programs indexed seven interagency study group reports describing over three hundred governmental programs in development areas such as health, nutrition, food, soils, and climate. Each program was coded into categories that describe its principal thrust, the activity, site, relevance to developing countries, technology transfer components, and funding sources. The index was prepared for the U.S. delegation as a guide to the more detailed seven volume survey and as a summary of U.S. programs on science and technology for development. The index was finished in December 1978.

1/ Data supplied by NSF: Awards in Direct Support of U.S. Preparations for UNCSTD and Charged to Budget Element 5940.

b. Analysis of Developing Country Demands

As a second in-house activity the Division of Policy Research and Analysis of the NSF is conducting an analysis of the developing country national papers for the UNCSTD for the office of the U.S. Coordinator. The immediate objective of the analysis is to identify potential developing country concerns at the Conference. As another goal, the data are being used to discern patterns in the needs expressed by developing countries and to compare them with the U.N. draft program of action, in order to evaluate the responsiveness of the U.N. summary and the U.S. program of action to the national papers of the LDCs. There is also a third objective: by analyzing the differences in the country needs, the NSF hopes to determine whether homogenous U.S. programs can be developed to respond to these countries as a group, whether there are subsets of countries needing different programs, or whether the needs are so diverse that programs must be tailored to each developing country's needs.

The analysis is computer based with 226 variables grouped into 51 different categories based primarily on guidelines for national paper preparation prepared by the United Nations. For instance, topical areas form the vertical axis of the matrix and at a general level include the following: basic research, adaptation, applied research and development, S and T information services, education and training, science and technology regulation and evaluation, industry and technology transfer, international cooperation and economic assistance, and changes in the U.N. and regional organizations.

The questions within these categories are aimed at identifying developing country needs, proposed solutions and where solutions should

be located (i.e., whether the solutions should be handled within the developing country, among developing countries, in developed countries or in international organizations). The horizontal axis of the matrix is formed by the subject areas which were selected as illustrative of developing country needs at the second "prepcom." These subject areas include: agriculture, health, industry, natural resources, transportation, communications, environment, and human settlements. Each subject area is broken down into subcategories. For example, agriculture is broken down into a "general" category, "land management," "crop and animal production," "product storage," "small holders," and "other."

The Foundation finished a preliminary analysis in February 1979. A draft was finished on July 20, 1979, titled "Analysis of UNCSTD Developing Country National Papers."

I. STATUS OF CURRENT U.S. POSITION PAPERS AND PREPARATORY ACTIVITIES

1. Two-page Position Papers on UNCSTD Issues for Use of the U.S. Delegation

The Coordinator's Office is now preparing several different types of short 2-page position papers for the use of the U.S. delegation to UNCSTD. The position papers deal with issues such as proposed foreign policy initiatives relating to science and technology for development, explicit reactions to the draft program of action proposed by the Group of 77, procedural questions, and process questions, such as U.S. policy for technology transfer. Some of the position papers will incorporate the research and policy suggestions which resulted from these various policy analysis efforts. The papers are scheduled to be finished by July 20. See Table E for an index of position papers being written.

2. Summaries and Syntheses of Recommendations for New Governmental Intiatives

The Department of State has also prepared summaries and syntheses of many of the recommendations prepared in the research, workshop and policy reports it funded, as well as some of the intra- and interagency memos prepared for the Coordinator's Office. The recommendations are categorized along functional lines to permit comparison of alternative policy recommendations by groups with different philosophical views or perspectives on how large or what U.S. foreign aid responsibilities should be. The basic document prepared by the Department of State, titled "The Ordering of Proposals for Possible U.S. Initiatives to be Offered at UNCSTD," includes proposals for initiatives in the following areas:

- industry,
- choice of technology (or appropriate technology),
- information systems,
- indigenous capacity,
- food, agriculture, and nutrition,
- health and population,
- energy,
- advanced technology,
- U.N. system, and
- general and miscellaneous.

See the Appendix for the summaries of recommendations contained in the synthesis report.

The Department also plans to distribute at the Vienna conference copies of many of the major research studies and conference reports prepared for the Coordinator's Office.

Table E

Index to Some of the Position Papers Which Will Be Written by the Department of State for Use of U.S. Delegates to the UNCSTD Meeting in Vienna 1/

Major Functional Issues:

- Program of action for UNCSTD covering the three target areas:
  - A. Strengthening the scientific and technological capacities of developing countries,
  - B. Restructuring the existing pattern of international scientific and technological relations, and
  - C. Strengthening the role of the United Nations system in the field of science and technology and the provision of increased financial resources.
- Financial arrangements, and
- S and T information systems.

Position and Background Papers on Related Issues:

- UNCTAD V Issues:
  - Evaluation of the world trade and economic situation,
  - Principles and rules and other issues relating to restrictive business practices,
  - Measures to augment the net flow and improve conditions of resource transfers from developed to developing countries,
  - Official bialteral and multilateral finance,
  - Private capital flows,
  - International code of conduct on technology transfer,
  - UNCTAD's contribution to economic, commerical and development aspects of industrial property system,

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1/ U.S. Department of State Memorandum on Position and Background Papers for UNCSTD, dated June 20, 1979.

- Strengthening technological capacity of developing countries and technological transformation,

- Brain drain,

- Special measures in favor of the least developed among LDCs,

- UNCTAD's work program on measures for strengthening economic cooperation among LDCs, and

- Recommendations for improved institutional arrangements to promote and strengthen economic cooperation,

- Measures of support for closer economic cooperation among LDCs, and

- Common fund,

Other Issues:

- Disarmament and development,

- Appropriate technology,

- Women in development,

- Code of conduct relating to MNCs,

- Technology transfer and effect on U.S. employment,

- LDC demands for quantification targets for developed country contributions to a fund for international development, and

- Role of the PLO in UNCSTD, and

Status of Recommendations of Other U.N. Conferences:

- Conference on Technical Cooperation Among Developing Countries, TCDC,

- Pugwash guidelines on S and T cooperation,

- WARC (World Administrative Radio Conference, 1979, to provide guidelines for the allocation of radio frequencies for communiations, and other purposes),

- Law of the Sea,

- UNCTAD V,

- Desertification/water/habitat/population/food,

- World conference on agrarian reform,

- New and renewable sources of energy (conference planned for 1981),

- U.N. Conference on Peaceful Exploration and Uses of Outer Space, and

- UNIDO III.

Background Papers and Key Political and Development Issues:

- Tokyo Summit,

- NIEO,

- Basic human needs strategy,

- LDC access to U.S. technology,

- International development strategy,

- Proprietary technology -- myths and facts, and

- Constraints on indigenous S and T capacities: U.S. perceptions.

Sectoral Issues:

- Population,

- Health,

- Education and training,

- Food and nutrition,

- Energy, and

- Industrialization.

Other Issues:

- Offical development assistance, and

- Status of U.N. technical assistance issues.

X. ROLE OF THE NONGOVERNMENTAL SCIENTIFIC COMMUNITY IN THE CONFERENCE

During an address made to the American Association for the Advancement of Science on February 14, 1978, UNCSTD Secretary General da Costa publicly reiterated a theme which has caused concern among some segments of the science and technology community. He said that the obstacles to the application of science and technology to development tend to be political, social, institutional, or cultural rather than scientific or technological. Application of science and technology to development will be one focus of the forthcoming Conference, but economic, social and political issues affecting applications constitute equally, if not more important agenda items for the conference. The U.S. State Department and some developing country spokesmen have reiterated this theme. As a result, a feeling is prevelant among some scientists and technologists that important aspects of science and technology will be neglected or inappropriately relegated to a secondary status in national papers. 1/

A. SEPARATE SCIENTIFIC MEETINGS SCHEDULED TO COINCIDE WITH UNCSTD IN AN EFFORT TO PLACATE CRITICISM THAT SCIENCE AND TECHNOLOGY ARE NEGLECTED

Although the issue of the emphasis to be given to science and technology probabably will not be resolved until the Conference is held, various accommodations have been made to give representation to scientists

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1/ See for instance Peter Collins. Pre-UNCSTD Colloquium Planned. Nature, May 3, 1979· 7; Anne Roark. UN Conference: Scientists Feel Cheerier. Science and Government Report, Jan. 15, 1979: 6-7; and John Walsh. Scientists Organize for UNCSTD and After. Consultation on Science and Technology Issues Issues for UN Meeting Seen As Step To Broader Involvement in Work on Development. Science, v. 204, June 29, 1979: 1394-1395.

and technologists. The national science associations of many countries participating in the conference have held pre-conference meetings to assess the issue and/or advise their governments. In addition several national and international groups of scientists and technologists have written position papers relevant to the conference theme.

According to news reports, these meetings have been notable since they illustrate two new characteristics of the international scientific community. First, they demonstrate that many scientists and technologists have made a commitment to applying science and technology to solving development problems and to assessing the disadvantageous side-effects of technological applications -- initiatives which differ from the typical basic research/science orientation of most scientists in the past. Second, the meetings and actions seem to have been based on the assumption that scientists of the "North and South" can meet, define problems and solutions without confronting the acrimony and adversary relations usually found in political meetings. Many UNCSTD planners in the State Department and the United Nations hope that the collaborative efforts set in motion during these deliberations among scientists will continue after UNCSTD. Some observers, indeed, believe that the development of cooperative relationships among scientists may well be the most fruitful outcome of the UNCSTD meeting. 1/

1/ See for instance: Walsh, Scientists Organize for UNCSTD and After, op. cit.

1. Forum A. Colloquium on Science, Technology and Society -- Needs, Challenges, and Limitations of Science and Technology as Factors of Development

In an attempt to placate critics who felt that science and technology were being shut out of UNCSTD, the United Nations arranged for two separate meetings on science and technology to be held in Vienna affiliated with UNCTSD, but not as part of the official meeting. One, a colloquium on "Science, Technology and Society -- Needs, Challenges, and Limitations of Science and Technology as Factors in Development," officially called Forum A, is an official U.N. event, and has a structured agenda. It will be sponsored by the U.N. Committee on the Application of Science and Technology to Development (ACAST) in Vienna the week before the UNCSTD meeting opens. This forum A, according to news reports, will be an opportunity for eminent scientists and technologists to "speak out on science policy for the developing countries," 1/ and to define and attempt to reach international consensus on scientific and technical issues affecting development. 2/ It is expected that this meeting will represent the views of "conservative" scientists from both developing and developed countries, many of whom customarily act in advisory capacities to their governments, and who probably will not be wholly supportive of NIEO demands for a restructuring of international financial, technology and aid mechanisms. 3/

1/ NGOs plan rival meeting. New Scientists, May 10, 1979: 450.

2/ Walsh, Scientists Organize for UNCSTD and After, op.cit.: 1394.

3/ NGOS Plan Rival meeting, op.cit.: 450.

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2. Forum B. Nongovernmental Forum on Science and Technology for Development

The second meeting, a "Nongovernmental Forum on Science and Technology for Development," sponsored by the Vienna Institute for Development, will run concurrently with the UNCSTD meeting, and will be an unofficially sponsored U.N. event. The forum is being held in the tradition of NGO meetings that the U.N. typically has organized in connection with global conferences. The objective is to permit NGO members who cannot participate in the official meeting to confer and present the results of their deliberations to the official meeting. 1/ The forum has also been characterized as serving a "safety-valve" function by giving interest group members a platform from which to critique the official intergovernnmental meeting.

This meeting, according to one news report, will be attended by a wide variety of European anti-nuclear groups and scientists sympathetic to NIEO demands. Issues expected to be discussed at the meeting include: environmental pollution caused by technology, the arms race, the displacement of women from the workforce as a result of the new technology, and the social and economic costs of the multinational companies. The NGO meeting is expected to endorse "the principle of a new international economic order to help finance "third world" R and D. Another issue considered important by the NGO committee is the means -- money, training, protective barriers for local industry --to make the developing countries more self-reliant in science and technology." 2/

1/ Walsh, Scientists Organize for UNCSTD and After, op.cit.: 1394.

2/ NGOs Plan Rival Meeting. New Scientist, May 10, 1979: 450.

The NGO forum, chaired by Karim Ahmed, a member of the staff of the Natural Resources Defense Fund in New York City, is described as "reflecting the Group of 77's feeling that science is too important to be left to scientists, who are a highly trained elite operating in areas inaccessible to public pressure." The forum's chair, in contrast, "believes in science by the people and for the people." 1/

The group has already held sessions parallel to the four "prepcoms" for UNCSTD held at the U.N. in New York City. At Vienna it is expected that the forum will be organized into task forces, each of which will produce a report covering such topics as health, nutrition and population, culture and development, environment and energy, the role of women, industrialization, "third world" cooperation, communications, and food and agriculture, 2/ how nuclear power affects the arms race, and nuclear nonproliferation. 3/ The NGOs represented at the meeting are expected to share the Group of 77 attitude toward multinational corporations, but ". . . at the same time to make a serious effort to overcome LDC skepticism toward appropriate technology which many object to as being second best." 4/

1/ Idem.

2/ Idem.

3/ Walsh, Scientists Organize for UNCSTD and After, op. cit., 1395.

4/ Idem.

It remains to be seen whether scientists' and technologists' demands for more representation at UNCSTD will be satisfied by these alternative sessions or whether they will provide the momentum needed for scientists to establish links for continuing cooperation in science and technology for development.

B. ORIGIN OF THE DILEMMA ABOUT THE ROLE TO BE PLAYED BY SCIENTISTS AND TECHNOLOGISTS IN UNCSTD

1. Science, Technology, and the Future

The dilemma started when the preparatory committee decided that national papers would not be required to address provisional item No. 4 of the Conference, that is "science, technology, and the future." As a result Secretary-General da Costa invited scientists to a four-day meeting in Geneva in November 1977 to permit them to discuss the item. Attendees at this meeting recommended the structure and contents of an "experts" report on science, technology and the future, which will be aimed at the decisionmakers attending the 1979 Conference. This report was intended to provide them with a basis from which to assess short and long-term potential applications of science and technology to development and to serve the demands of many of the developing countries, who feel the 1979 meeting should set in place international institutions, structures, and processes that will then be used to implement science and technology projects in different countries.

Three reports were prepared for this agenda item. However, the reports do not appear to have been discussed in the most recent preparatory meetings.

One report, called "Dynamism and Development," consists of a general

essay covering in a broad sweep the issues enumerated at the Geneva meeting. The report concludes that rather than relying on the market system to select technologies for development (because of short-term profit motives), an effort should be made to create governmental entities to select technologies for development based on their long-term implications for human needs and their contribution to the entire socio-economic system. However, some have criticized this approach as being a "benevolent dictatorship" of a technocratic elite. The report was prepared jointly by Harlan Clevaland, Director, Program in International Affairs, Aspen Institute for Humanistic Studies, and Ibrahim H. Abdel Rahman, former Minister of Planning and Administrative Reform, Egypt; and former Director of the United Nations Industrial Development Organization. 1/

The second document under the theme of science and technology and the future is titled "The Critical Point." It deals mainly with the strategies of development, according to structured forecasting methodologies. It was prepared by a group of authors whose work was directed and coordinated by Charles Moraze, Director, Maison des sciences de l'homme and Institut d'etudes du developpement economique et social, Paris. 2/

The third report, called "The Contribution of Transnational Enterprises to Future World Development: A Report," was prepared by the Industrial

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1/ Issued under the symbol A.CONF.81/5/Add.1, July 3, 1979, 35 p.

2/ Issued under the symbol A/CON.81/5/Add.2.

Sector Advisory Group to the Secretary-General of the UNCSTD. It stresses that governments should respect the property rights of multinational firms. Governments can do this while insuring that multinational firms operate to the advantages of national development. But a prerequisite for this result is the development of national science policy plans and development goals.

It is expected that these reports will be circulated at Vienna during the meeting. The current program of action for the Conference does not contain recommendations dealing with this agenda item, except implicitly.

2. Scientific and Technological Meetings Held As a Prelude to UNCSTD

a. Meetings Affiliated With ACAST

The November 1977 meeting in Geneva, co-sponsored by the U.N. Advisory Committee on the Application of Science and Technology to Development, ACAST, also set in motion a series of meetings, sponsored by or affiliated with ACAST, held by scientists throughout the world to support preparations of the "experts" paper.

For instance the following meetings were held:

- "Science and Technology for Solving Global Problems Facing Mankind," sponsored by the Soviet Academy of Sciences and ACAST, held at Tallin, in the Soviet Union, January 8-12, 1979;

- "Technology for Development," sponsored by the U.N. Department of Technical Cooperation and Development and ACAST, held at Abidjan, Ivory Coast, April 9-13, 1979:

- "Science, and Technology in Development Planning," sponsored by El Colegio de Mexico, ACAST, and the U.N. Department of Technical Cooperation and Development, scheduled for Mexico City, May 28-June 1, 1979.

b. ICSU Meeting

As another approach, the International Council of Scientific Unions (ICSU), in cooperation with 19 other international professional organizations, held a meeting in Singapore in January 1979, involving some 140 participants from 40 nations to help crystallize options from the scientific community to the UNCSTD. The group's findings reflected a relatively new priority among scientists -- that of recognizing that science and technology can, with limited objectives, be used to aid in solving developmental problems. The group proposed an action program which involves direct links between scientists and technologists in the developed and developing nations. The report of the Singapore meeting endorsed the Group of 77 demand for creation of a science and technology development fund. Funds would come from a "consortium of donors," including U.N. agencies, multinational corporations, and national aid bodies. The fund would be administered by an independent body, somewhat along the lines of the Canadian International Development Research Center, IDRC, or the Swedish Agency for Research Cooperation With Developing Countries, SAREC.

The Singapore group recommended that the fund be used to pay for research projects planned and carried out jointly by scientists of ICSU and other international scientific bodies. The Singapore organizing committee would become a permanent committee charged with identifying global problem areas for which scientific and technological knowledge required for development were lacking. A continuing steering committee of ICSU was organized for these purposes. Some of the problem areas already targeted by the group relate to meeting basic human needs -- forestry management, tropical architecture and human settlements; nutrition and human health; fish farming; rural energy supplies and water resources; and development of rural agricultural industries. The group also stressed that more emphasis be given in development planning to the role of the social sciences -- in helping to design societal innovations needed for development. 1/ They recommended also:

- establishment by developing countries of indigenous science and technology structures to conduct basic and applied research and development to train scientists,

- establishment of technical schools and junior colleges to build up a technically trained manpower pool, and

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1/ Scientists Take Action on Development. New Scientist. March 15, 1979: 843; Stephanie Yanchinski. Towards UNCSTD. New Scientist, March 15, 1979: 842; Internnational Symposium on Science and Technology for Development, Singapore, Jan. 22-26, 1979. Report of the Chairman of the Steering Committee (Dr. Thomas F. Malone, Foreign Secretary, National Academy of Sciences), April 20, 1979. 9 p.

- establishment of regional R and D institutes along problem-oriented lines, such as in agriculture and fisheries. 1/

c. Pugwash Meetings

The Pugwash Conference on Science and World Affairs, a group devoted primarily to securing disarmament, has also sponsored at least two seminars to generate suggestions for action at UNCSTD. In December 1978, the Pugwash group prepared and published a list of "Guidelines for International Scientific Cooperation for Development." The guidelines correspond closely to the list of demands made by the Group of 77 in draft programs of action considered by the UNCSTD prepcoms. Covered are such politically sensitive North/South issues as resource sharing, technology transfer and the need for "LDCs to build up an autonomous capability for problem solving, decision-making and implementation in all matters relating science and technology to development." 2/ However, unlike the ICSU group, which emphasizes action by scientists, the Pugwash guidelines see room for productive cooperative action on intergovernmental projects. It is

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1/ Roger Revelle. "North" Meets "South" Without the Bickering. Nature, v, 279, May 3, 1979: 10-11.

2/ Pugwash Conferences on Science and World Affairs. Pugwash Guidelines for International Scientific Cooperation for Development. Dec. 1978: p. 2.

expected that the Pugwash proposals will be further refined at the 29th Pugwash Conference on Science and World Affairs, planned for July 1979 in Mexico, and that they will be discussed at Vienna Forums A and B.

A more radical statement on science, technology and development was prepared and transmitted to the UNCSTD planners by the Pugwash Executive Committee on Military Technology, Disarmament, and Development. It was based, in part, on a workshop held in March 1979 in Baden, Austria. In order to achieve the science and technology goals of the New International Economic Order, the group recommended, among other things, examination of how military uses of science and technology may distort development, "a tax on military expenditures in all countries, which would be pooled centrally and used for development purposes," "international conversion projects whereby scientists and engineers, as well as development and production facilities, are transferred from militarily-oriented programs . . . to solve urgent problems of civilian relevance . . . for developing countries," and "an international programme of conversion linking armament manufacturing capacity to the satisfaction of genuine needs [as proposed by some trade unionists]." 1/

1/ Statement from the Pugwash Executive Committee on Military Technology, Disarmament and Development, March 1979: 4 p.

C. THE INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT'S FOCUS ON APPROPRIATE TECHNOLOGY

The International Institute for Environment and Development, a research and advocacy group devoted to development, presided over by Barbara Ward, held a symposium on "Mobilizing Technology for World Development," (The Jamaica Symposium), from Jan. 7 to 11, 1979. Twenty-five scientists, technologists, business executives, development economists, bankers, and political and social leaders attended the meeting. The basic objective was to discuss the common interests of rich and poor countries in mobilizing science and technology for development. Appropriate technology was also stressed. The Symposium was co-chaired by Mahbub ul Haw and Ivan Head.

The report emphasized the importance of using appropriate technology in considering solutions to the developmental crisis. Developing country leaders need to ask not only "what technology?" but also "technology for what?" Four goals could be met by mobilizing technology for development: overcoming the worst aspects of poverty, facilitating a more equitable international division of labor, improving the management of global problems, especially those relating to natural resources, and doubling per capita income and food production in developing countries by the year 2000.

Unlike some of the more radical positions taken by some proponents of UNCSTD, the Jamaica participants identified considerable areas of convergence between the North and South: on using technology to manage global problems, in developing LDC indigenous technological capacity, and in negotiating effectively with transnational corporations.

The group made the following recommendations for actions to be taken by decisionmakers at UNCSTD: 1/

6. Based on this analysis, the Jamaica Symposium made several major recommendations:

(i) An ad hoc independent commission of non-governmental experts, consisting of both thinkers and doers, representing all parts of the world, should be set up (a) to analyze present and future technological and scientific trends, and from their analyses of alternative scenarios, (b) to define and recommend priority areas for major new programs of the North-South collaboration. For example, the commission might consider how to develop an integrated approach to research development, and promotion of non-food agricultural commodities whose export is vital to developing countries, and whose availability is important to developed countries. The commission should also consider the advisability and structure of a permanent mechanism to carry out its functions. The recommendations of the commission should lead to major new programs of North-South technological collaboration based on mutual self-interest. This collaboration should take advantage of scientific and

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1/ International Institute for Environment and Development. Mobilizing Technology for World Development. Report of the Jamaica Symposium. Jan. 21, 1979: iii-vi. See also: Jairam Ramesh and Charles Weiss, Jr., eds. Mobilizing Technology for World Development and the Complete Report of the Jamaica Symposium. Washington, Overseas Development Council, July 20, 1979. 240 p.

technological resources wherever they may be located--specifically including developed countries--but should be designed to strengthen the capability of the developing countries and to give as much responsibility as feasible to developing country participants.

(ii) Research and development (R&D) expenditure in the developing world, which is only about 4% of the world-wide total at present, should be greatly increased by the year 2000. More research needs to be directed to social needs, and R&D organizations should be kept relatively autonomous with adequate financial support to sustain long-term activity.

(iii) External assistance agencies should use a larger part of their resources to support R&D and other innovative programs within developing countries and should channel such support, preferably through relatively autonomous funding mechanisms, to groups capable of generating and disseminating technology. The International Development Research Centre of Canada, which is dedicated to the enhancement of research competence within the developing countries, is a good illustration of such support through bilateral channels. Some participants suggested that a certain proportion of current assistance should be set aside by external agencies to be channeled through a specialized international organization, under genuine international control, and with its own specialized knowledge and operational policy to handle the complex issues in the technology market. Establishment of autonomous (including non-governmental) funding institutions in developing countries would facilitate providing a link between the development of local capability and programs of international cooperation on global problems.

(iv) National scientific and technological capability in developing countries needs to be greatly enhanced at all levels of society, specifically including training programs, natural resource surveys, common service organizations, and specialized financial institutions for the small farmer and entrepreneur. Although the group recognized that

the task of building indigenous technological capacity is slow, arduous, and costly, it believed that the ability of developing countries to define national development goals clearly and then to chose and adapt the technologies needed to achieve them is essential if the international system is to evolve into an equal partnership.

(v) International assistance agencies should invest a greater proportion of their resources to identify and test innovative approaches within developing countries. Such agencies should be more cautious about relying on 'proven' technologies, because such technologies have often been proven in different contexts and endowments than those prevailing in the developing world.

(vi) Improved mechanisms must be instituted to gather and disseminate information on technological alternatives. Sector-specific data banks at national, regional and international levels need to be expanded.

(vii) More and improved forms of cooperation among science and technology organizations, along the lines of those being supported by the Consultative Group on International Agricultural Research, are needed to facilitate the transfer of technology and supporting scientific knowledge, both between developing and developed and, in particular, among developing countries. Practical suggestions in this direction, were made at the 1978 United Nations Conference on Technological Cooperation among Developing Countries.

(viii)More effective institutional means and incentives need to be developed for transfer of commercial technologies to the least developed countires, particularly from the industrialized developing countries.

(ix) Non-governmental organizations (foundations, universities, non-profit agencies, public volunteer organizations, etc.) have a proven capability in innovative, risk-taking and people-oriented activities. More support, both internal and external, should be channeled to them.

(x) Educational and training institutions at all levels should be established in developing countries and transnational enterprises should be encouraged to do more to train technical and managerial personnel.

(xi) The capability of developing countries to negotiate on a more equal basis for the acquisition of foreign technology should be strengthened, so as to increase the prospects for effective, stable agreements in the basic interest of all parties. Among measures to this end, the efforts to revise the Paris Convention on Patents and develop a code of conduct for transfer of technology, are most important.

(xii) Higher priority in national policy concerns in international fora should be given to need for more effective adjustment mechanisms, and employment policies in the more industrialized countries. The impacts of developments in North-North competitive economic interests on the nature of North-South technology flows need to be carefully monitored.

7. The Symposium expressed the belief that these recommendations were consistent with and contribute to a range of global and national development goals increasingly attracting support. These goals are: (a) the overcoming of the worst aspects of poverty by the year 2000; (b) achievement of self-reliant, sustainable economic growth, including a doubling of per capita income and food production by the end of the century; (c) the more efficient management of global problems, particularly those relating to natural resources; and (d) the facilitation of a more effective and equitable international division of labor.

8. The group concluded that over the long run, the political will required to sustain progress on any of these four goals depends on simultaneous and coordinated action on one or more of the other goals. Thus, for example, the level of international cooperation mobilized for overcoming the worst aspects of absolute poverty will be dependent on the level that can be mobilized for advancing self-reliant growth and

vice versa.

9. The Symposium invited the United Nations Conference on Science and Technology for Development, the Brandt Commission, the United Nations Conference for Trade and Develoment, and the Special Session of the UN General Assembly to take account of these findings in their deliberations.

D. THE ROLE OF THE AMERICAN SCIENTIFIC COMMUNITY

Members of the American scientific community have also played a significant role, individually and in formal and informal groups, in conference preparations. For instance, shortly after completion of the Department of State's November 1976 national conference on UNCSTD, several influential persons in the scientific, academic and nongovernmental communities corresponded with the newly elected Administration, advising it of their ideas for the Conference. Several past presidents of the American Association for the Advancement of Science sent a joint letter to Secretary of State-elect Vance, expressing concern that a disproportionate emphasis was being placed on the transfer of proprietary technology in U.S. policy for the developing countries. They suggested that greater emphasis be placed on public technology and on recognition of new types of technology needed for development. They and others after them also stressed that the United States needed to emphasize meeting "basic human needs" in their dealings with developing countries.

Also Dr. Frederick Seitz and Mr. Rodney Nichols, both of whom have served on the U.S. delegation to the U.N. Committee on Science and Technology, wrote a letter (on behalf of a distinguished group of scientists, engineers, and physicians) to President-elect Carter deploring the lack of scientific and technological consideration in U.S. foreign policy dealings with the LDCs. They suggested specific areas warranting attention in light of LDC needs in a working paper entitled "An Outline of Issues and Suggestions for the United States to Consider in Programs of Science and Technology to Meet the Goals of Developing Nations."

1. Activities of the Council on Science and Technology for Development

A group of approximately 50 American scientists and technologists formed a nongovernmental group to advise and counsel policymakers on issues related to the UNCSTD and related topics. Called the "Council on Science and Technology for Development," the group is chaired by Dr. Frederick Seitz, and directed by Dr. Charles Dennison and Dr. Glenn Schweitzer. Funding is supplied by government agencies and private foundations, such as the Ford Foundation. The Council has presented policy papers to the Department of State and the Office of Science and Technology Policy in the Executive Office of the President on such topics as: the proposed International Develoment Foundation; advice on the structure of a proposed Institute for Scientific and Technological Cooperation; relations with middle income countries; priorities for policy research relating to science, technology and development; and assessment of the corporate role in developing governmental policies for technology transfer and for infrastructure in less-developed countries.

An organizing committee of the Council also wrote a paper entitled "U.S. Objectives and Strategy for the U.N. Conference on Science and Technology for Development," on October 31, 1977. It stressed certain specific actions the government should take to define objectives, strategy, and tactics for UNCSTD. Reflecting a view held by many scientists but rejected by many politicians and diplomats, the group recommended that scientists should play a major role in UNCSTD preparations and the actual conference, and that the UNCSTD should focus on developing collaborative efforts between scientists of developed and less developed countries in specific applications of science and technology. Thus:

> Among the ingredients of a successful conference are (a) broad participation in the entire Conference process by leading scientists, engineers, and physicians from the developing countries; (b) a Conference agenda that emphasizes consideration of specific collaborative opportunities in science and technology as well as appropriate analytical consideration of issues that may be politically contentious; and (c) a series of Conference actions which reflect a sense of global priorities in applying science and technology to development and which establish an improved international organizational framework for addressing the most urgent problems. The Conference [should] stimulate a climate within developing countries receptive to their own generation and application of science and technology, thereby reinforcing their small and often isolated professional communities. . . . 1/

The major goal of the conference, according to the Council, should be to outline opportunities and programs for collaboration between bilateral, regional, and international groups of nongovernmental scientists to deal with some of the most pressing global science and technology problems facing the world as identified in recent global science and technology conferences, such as:

> the proceedings and follow-up activities of past U.N. World Conferences, the work of the International Council of Scientific Unions and the Scientific Committee on Problems of the Environment (SCOPE), the present research on global trends of the International Federation of Institutes of Advanced Studies, and the activities of the National Academy of Sciences, such as food and nutrition as well and energy and climate.

This proposal would have required that some of the world's leading "global scientists" complete "an authoritative assessment of global

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1/ Organizing Group of the Council on Science and Technology for Development. U.S. Objectives and Strategy for the U.N. Conference on Science and Technology for Development. Washington, D.C. Oct. 31, 1977, p. 4.

2/ Ibid., pp. 2-3.

problems from a scientific perspective" to identify solutions needed to aid developing countries and to "mute the diplomatic polemics expected at the Conference." 1/ The group also compiled a preliminary listing of science and technology issue areas needed to inventory U.S. programs and policies in science and technology for development. The list undoubtedly was influential in helping the National Research Council develop the typology it used to prepare its research report, U.S. Science and Technology for Development.

2. The American Association for the Advancement of Science

The American Association for the Advancement of Science (AAAS), has played an active role in supporting both non-governmental scientific preparations and official governmental preparations for UNCSTD. On behalf of the Department of State, the AAAS sponsored four workshops and issued reports containing recommendations for action in the areas of: women and development; building national institutions for science and technology in the developing countries; organized labor's concerns; and the role of professional societies. (These were described in detail in section IX. H.)

AAAS also has focused attention on informing the American scientific and engineering community about the planning, organization, and objectives of UNCSTD and increased its interactions with other national science associations and international scientific groups to examine actions needed to enhance the application of science and technology to development. AAAS activities have included the following:

1/ Ibid., pp. 4, 5.

- representation at the November 1976 Department of State conference on UNCSTD,

- sponsorship of a seminar in September 1977 to examine non-governmental organization initiatives related to U.S. preparations,

- sponsorship of a symposium during the 1978 AAAS Annual Meeting on UNCSTD,

- participation of AAAS staff in working groups coordinated by the National Research Council for the report it prepared for the Department of State,

- testimony at hearings held by the Senate Committee on Commerce, Science and Transportation in November 1977,

- participation in workshops organized by such bodies as the Congressional Research Service and the Brookhaven National Laboratory,

- publication of editorials in Science magazine, dealing with the role of scientists and the place of science and technology in the conference,

- involvement of the AAAS executive officer on the steering committee for U.S. preparations, and

- participation of AAAS staff in the non-governmental organization activities being organized by the National Resources Defense Council in New York (which is chairing the official NGO Forum B meeting) to be held in Vienna.

Internationally, AAAS sponsored two major symposia in cooperation with other science associations, foreign and regional. In cooperation

with the Interciencia Association and the Brazilian Association for the Advancement of Science, AAAS sponsored a symposium on "Energy and Development in the Americas," in Brazil, March 12-17, 1978. The proceedings and recommendations resulting from this meeting were presented by officers of the associations to the UNCSTD secretariat at a special meeting, held in New York City on July 11, 1978.

A second foreign meeting was AAAS co-sponsorship with the Indian National Science Academy and the Indian Science Congress Association of an "Asian Regional Seminar on the Contributions of Science and Technology to National Development," held in New Delhi, October 4-6, 1978. The meeting brought together scientists from the United States, India and 15 other countries in the Asian region. The proceedings of the seminar will be distributed in Vienna to UNCSTD delegates. A shorter report on the seminar was presented at the "Symposium on Trends and Prospects With Regard to the Development of Science and Technology and Their Influence in the Solution of Contemporary Global Problems," held in Tallin, Soviet Union in January 1979 and to the International Symposium on Science and Technology for Development, held in Singapore in January 1979. 1/

1/ Information about AAAS activities is from interviews and from: AAAS. AAAS and the U.N. Conference on Science and Technology for Development. March 1979: 2 p. The report referenced is: Report on the Asian Regional Seminar on The Contributions of Science and Technology to National Development. Organized by the Indian National Science Academy, the Indian Science Congress Association, and the AAAS. New Delhi, Indian National Science Academy, October 4-6, 1978. 42 p.

XI. THE IMPORTANCE OF APPROPRIATE TECHNOLOGY

A. BACKGROUND TO CONGRESSIONAL INTEREST IN APPROPRIATE TECHNOLOGY

As noted above, Section 507 of the Foreign Relations Authorization Appropriations Act of 1978, P.L. 95-105 signed by the President on August 17, 1977, requires that the President insure that emphasis be given to light capital technology in defining the U.S. position for the UNCSTD. Representative Clarence Long was the original sponsor of the section.

Congressman Long's amendment to the Foreign Relations Authorization Act defines light capital technology as:

> . . . those means of production which economize on capital wherever capital is scarce and expensive and labor abundant and cheap, the purposes being to insure that the increasingly scarce capital in the world can be stretched to help all, rather than a small minority, of the world's poor; that workers will not be displaced by sophisticated laborsaving devices where there is already much unemployment; and further, that poor nations can be encouraged eventually to produce their own capital from surplus labor time, thus enhancing their chances of developing indepdendently of outside help.

Congressman Long elaborated by defining light capital technology as a capital investment of $100 or less per worker employed by any given project, but that this measurement was intended to illustrate a general order of magnitude rather than a strict limit.

Subsequently the Congressman requested the General Accounting Office to evaluate how the Federal Government was responding the the statutory requirement to emphasize light capital or appropriate technology in planning for UNCSTD.

B. OVERVIEW OF POLICY DILEMMAS SURROUNDING APPROPRIATE TECHNOLOGY AS A PART OF THE PROGRAM OF ACTION FOR UNCSTD

Advocates of appropriate technology are found in both the "North," or developed nations, and the "South," or the developing nations. But critics of appropriate technology are found also in both "camps," with many developing country spokesmen bitterly opposed to the emphasis some officials are giving to appropriate technology. Critics view appropriate technology as a device for the rich countries to keep the poor countries technologically-undernourished and underdeveloped so that the rich countries can continue to reap the benefits of a primary product exporting economy.

Other less emotional critics fault appropriate technology by saying that since "third-world" scientists are so few in number to begin with, any emphasis on promoting appropriate technology would absorb all available scientific manpower in developing countries in appropriate technology research and innovation, leaving no capability for "third-world" scientists and technologists to do more advanced research necessary to compete in an industrialized world. Other critics fault the emphasis some developed nations are giving to appropriate technology in UNCSTD because they say, most of the developed countries have been notoriously unwilling not only to to fund research in "third-world" laboratories, where most of the work would be done, but also to approve bilateral or multilateral cooperative research and development projects between the developed and developing world, where appropriate technology is emphasized. Developed countries, they say, want to participate only in those cooperative scientific projects which will benefit the scientific and technological know-

ledge base of the developed countries -- and appropriate technology projects do not meet this criterion.

The movement for appropriate or light-capital technology generally owes its origins to scientists and technologists of the Western developed nations. Some were sincere in their belief that developed nations cannot promote development in the "third" and "fourth" worlds by transferring advanced, highly capital intensive technology into economies overburdened with abundant cheap labor and a scarcity of capital for technology investment. Others saw the problem differently. They said that the recent history of U.S. technology transfer and development assistance efforts, especially those in the Agency for International Development, demonstrated unequivocally that attempts at creating modern industrialized societies in dualistic economies -- characterized by two classes whose levels of socioeconomic development were at opposite ends of a scale with no middle class inbetween -- merely exacerbated the dualism, enriching the wealthy and plunging the poor into greater poverty. A preferred policy solution, then, would be to emphasize in U.S. developmental assistance programs, targeting assistance and aid to the poor -- via programs for satisfying basic human needs and appropriate technology (which would produce technologies easily adaptable in the culture and which would take up the slack in employment.) At the same time, assistance should emphasize programs to build up the infrastructure needed for sustained economic growth and scientific and technological achievement --- transportation and communications networks, technical schools, literacy programs, intra-regional markets, health services delivery capability, and small-scale vertical manufacturing production cycles, etc.

Reviews of national and regional papers, prepared by the National Science Foundation, and others indicate that the least developed of "third and fourth world" countries, especially the African nations place greatest emphasis on appropriate technology. These nations are also the most interested in UNCSTD substantive actions (variously labelled "basic human needs," "choice of technology," "appropriate technology," or "light capital technology"), which, regardless of their labels, are intended to promote adequate rural development, health care, housing, energy and infrastructure. Because they have not yet established a large industrial base and entrepreneurial sector of society, these nations are less interested in issues relating to terms of technology transfer and controlling MNCs than are the more developed of the less-developed countries, such as some of the Latin American nations which have achieved moderate levels of self-sustained growth.

1. UNIDO Forum on Appropriate Industrial Technology

*Many of these issues were discussed at the International Forum on Appropriate Industrial Technology, conducted by the United Nations Industrial Development Organization (UNIDO), in November 1978, in New Delhi, India. The first of this two-part meeting, attended by 314 officials and experts from forty-seven developed and developing nations, had as its objectives:

(1) The discussion of detailed conceptual implications of appropriate technology and the policy norms that may need to be adopted

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* Paragraphs preceded by an * were prepared by Wendy H. Schacht, Analyst in Science and Technology, Science Policy Research Division, Congressional Research Service.

to meet appropriate technology goals, and the discussion of specific production technologies in twelve selected sectors representing inudstries meeting basic research and technological needs;

(2) The consideration of specific alternative technologies in the selected sectors from the perspective of socio-economic and technological development in semi-urban and rural areas in the developing world;

(3) The consideration of appropriate policy measures which could ensure effective development and application of such products and processes; and

(4) The promotion of more extensive international cooperation and allocation of resources for the stimulation of research and development at both the industry and government levels. 1/

*The findings of the preliminary session were presented at the ministerial-level meeting, which was attended by twenty-nine countries, both developing and developed. This group endorsed the general applicability of appropriate technology ". . . both to the large-scale and small-scale sectors, and noted that it was relevant to policy both in developing and developed countries." 2/

1/ United Nations Industrial Development Organization, International Forum on Appropriate Industrial Technology. Draft Report of the Technical/Official Level Meeting to the Ministerial Level Meeting, New Delhi/Anand, India, Nov. 20-30, 1978, p. 1.

2/ United Nations Industrial Development Organization. International Forum on Appropriate Industrial Technology. Report of the Ministerial-Level Meeting, New Delhi/Anand, India, Nov. 28-30, 1978, p. 6

*The report that resulted from this meeting developed a conceptual and policy framework for appropriate technology which included a discussion of development strategies, government policies for appropriate technology, national technology plans, institutional mechanisms, and international cooperation. The ministers also prepared an action program which stressed technological choice and offered UNIDO's assistance to developing country governments in their appropriate technology activities. And finally, the U.N. Industrial Development Orgnization was requested to submit this report for consideration at the U.N. Conference on Science and Technology for Development.

C. FUNDING AND RESEARCH SUPPORTED ON APPROPRIATE TECHNOLOGY BY THE GOVERNMENT FOR UNCSTD

Information supplied by the National Science Foundation and the State Department, indicates that the U.S. Government has devoted about 10 percent of the resources for UNCSTD to appropriate technology efforts. This constitutes about $360,000 of a $3.5 million budget. (Precise financial details are provided in table C.) Specifically, the State Department has used $60,000 from a transfer of AID funds to explore the issue of technology choice issue. The UNCSTD draft program of action uses the term choice of technology for the phrase appropriate technology in official documents which will be discussed at Vienna. This $60,000 includes State Department sponsorship of the December 1978 Winrock workshop on AT; and other analyses

dealing with criteria and procedures used in selecting technologies for development; and studies of technological impact on such factors as societal cohesiveness, employment, use of capital use, environmental pollution, and depletion of nonrenewable resources. NSF has sponsored two AT-related research projects for UNCSTD preparations, totaling almost $66,000. AID has provided about $232,000 of its own funds for four studies.

The topic of appropriate technology has also been addressed in some of the major studies done for the Coordinator's Office, and has played a major role in some of the NGO deliberations sponsored by the State Department.

The United States undoubtedly will encounter some opposition to appropriate technology among some segments of the Group of 77 in the UNCSTD meeting. The following section of this report details efforts made by the executive branch to integrate appropriate technology into U.S. developmental policies.

D. CRS REPORT ON " EXECUTIVE BRANCH EFFORTS TO INTEGRATE APPROPRIATE TECHNOLOGY INTO U.S. ACTIVITIES FOR UNCSTD" 1/

1. Definition of Appropriate Technology

Appropriate technology (AT)* is a concept which is gaining acceptance in the conduct of our international technical assistance programs. As construed within the international endeavor, appropriate technologies are those

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1/ Prepared by Wendy H. Schacht, Analyst in Science and Technology, Science Policy Research Division, Congressional Research Service.

* The term "appropriate technology" is used throughout this paper. However, it should be noted that, in practice, other terms including "intermediate technology" and "alternative technology" have been utilized to refer to essentially the same idea.

technologies introduced to, or developed within, a country which have been designed to complement its technical skills, indigenous resources and needs. This approach works within the socio-economic structure of the developing nation to insure that the technologies developed or transferred meet that country's industrial, financial, educational, and employment capabilities while simultaneously providing products or processes which will contribute to continued economic growth.

The developing countries generally have a large unemployed, underemployed, and unskilled labor force, few capital assets (with the exception of the oil rich states), and at best, a limited technological infrastructure. The appropriate technology concept accepts these conditions for development and works to promote modernization and growth within these constraints. Thus, given the overall LDC environment, appropriate technologies are generally low-cost, easy to maintain, decentralized, labor-intensive technologies which utilize local resources.

However, advocates of appropriate technology stress that choice is fundamental to the AT idea. A balanced approach to development and transfer requires that all levels of technology be considered when making a technological decision. Selection should be based upon a realistic assessment of the overall needs and capabilities of the country. Advanced Western technologies should not be excluded from consideration even though the desires of developing nations to industrialize may not be fulfilled completely through their importation. The choice of technology should be dependent on the indigenous patterns of consumption, labor, and resources, rather than on exclusive reliance on either

"advanced" or "small-scale" technologies. Likewise, the criteria on which the choice of "appropriateness" is based cannot be limited to technological considerations. Also of consequence are political, economic, cultural, environmental, and social factors.

The principles behind the appropriate technology concept are being incorporated and integrated into the various activities of the U.S. foreign assistance program. This has occurred both on behalf of the agencies themselves and because of certain legislation which has mandated the establishment of AT efforts in the various departments. In recognition of the importance of the appropriate technology concept, Congressman Clarence Long, offered an amendment to the Foreign Relations Authorization Act for FY78 which was incorporated into the final bill. This law, P.L. 95-105, mandates that the President take action to insure that an emphasis on light capital technology be made in conjunction with the U.S. position at the United Nations Conference on Science and Technology for Development. Expanding the scope of the directive to include "appropriate technology" rather than the more restrictive "light capital technology," this chapter seeks to identify and assess the Executive Branch efforts to integrate AT into the U.S. position for UNCSTD.

2. U.S. National Paper

The major statement of the United States' position for the United Nations Conference has been the U.S. National Paper. In terms of the subject of appropriate technology, some of the thinking was responsive to research funded by U.S. agencies in preparation for UNCSTD and to consultations with AT field practitioners. Additional input to the evolving

U.S. position is being contributed by various ongoing AT-related studies and a continual dialogue with some members of the appropriate technology community. This section explores the treatment of AT in the U.S. National Paper.

The appropriate technology concept is acknowledged as a part of the U.S. contribution to science and technology for development in the developing countries. In the U.S. National Paper, the AT idea is recognized both explicitly and implicitly. In discussing and defining appropriate technology, the paper outlines the U.S. concern for the choice of technology in development and the importance of understanding that there are various types of technologies and technological processes which can provide ". . . goods and services . . . in a manner which is compatible with . . . economic and social conditions." 1/ In delineating the other concerns of the U.S. development assistance endeavor, the conference paper alludes to the concepts behind the AT idea. By advocating activities to foster indigenous science and technology capabilities, the United States' position is to ". . . enable the developing countries better to generate, select, and apply science and technology in pursuit of their own economic and social goals [emphasis added]." 2/ This is consistent with the appropriate technology concept.

1/ U.S. National Paper, op. cit., p. 28.

2/ Ibid., p. 4.

Other considerations basic to the AT philosophy are articulated in the U.S. paper. The importance of employment to development is delineated. Integrating the unemployed and underemployed into the economic system is recognized as vital to self-sustaining growth in the developing nations. To this end, the paper indicates that both U.S. and developing country policies and practices should promote employment. Technological and economic growth through self-reliance is also supported by the U.S. position and AT advocates. Dependence on the industrialized nations for assistance is not conducive to long-term LDC development. Nor is the exclusive utilization of foreign technologies. Thus, the U.S.paper states, "strengthening the ability of developing countries to make [technological] choices for themselves and to carry out any necessary adaptions is a fundamental factor in enhancing their self-reliance." 1/

The wholesale transfer of technology is no longer viewed as the panacea for development and industrialization. The current thinking depicted in the U.S. National Paper indicates that " . . . it is becoming generally accepted that technologies -- whether imported, adapted, or developed indigenously -- must be suitable to local conditions [emphasis added]." 2/

1/ Ibid., p. 7

2/ Ibid., p. 8.

For development to occur and be sustained, transfer must be coupled with innovation to insure that technologies can be integrated into the economic, social, and political environment of the developing nation. It is also recognized that this is affected by various diverse considerations. As the paper states:

> Both innovation and transfer are influenced by such factors as the social and cultural fabric of the country, the resource base, the availability of capital, skilled labor, exchange rates, interest and wage rates, the quality of managerial and engineering expertise, access to supporting scientific and technological institutions comparison, and the incentives and disincentives created by governmental policies and market conditions. 1/

The analyses of past U.S. experience offered in the National Paper discloses the "critical misjudgment" 2/ of policymakers who used the United States and the Western nations as models for industrialization by the developing countries. It is now recognized that the developing countries have needs and exist in environments and situations different from those in which the West industrialized. Thus the U.S. position is to assist in developing local expertise and building an indigenous scientific and technological infrastructure which can make objective assessments of the impacts of technological choice. Because, as the report indicates, ". . . the introduction of new technologies -- imported or domestic -- can create sharp discontinuities with harmful side effects on a country's culture, social dynamics, and political institutions and can

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1/ Ibid., p. 8.

2/ Ibid., p. 21.

have a dislocating impact on the existing economic endowment factors," 1/ there is a need to be more critical and objective when transferring or utilizing science and technology.

The "trickle down" theory of development in which it is believed that the benefits of an advanced technological infrastructure would "trickle down" to the masses has been replaced by a concerned effort to meet "basic human needs." According to the U.S. National Paper, the development assistance program's challenge is one

> . . . of insuring that its resources reach the people who are most in need of help. This goes far beyond the mere provision of commodities or food or health services. It goes to programs of lasting impact, of making even the neediest people self-reliant and full-fledged participants in the economy and society, people who can in time become more productive and meet their basic human needs without continuing dependence on beneficial assistance. 2/

Appropriate technology plays an important role in meeting these basic human needs by the emphasis placed on, among other things, employment, innovation, decentralization, and self-reliance.

The importance of the choice of technology is explicitly stated in the National Paper. Emphasizing that "appropriate technology" is not always synonymous with "small-scale technology," the section on AT in the U.S. National Paper reads:

1/ Ibid., p. 23.

2/ Ibid., p. 27.

Whether a specific technology is the "right" type of technology depends on site-specific considerations, including the availability of techical and managerial skills, labor, and capital resources. Depending on the problem and available resources, the choice of technology may be labor-intensive or capital-intensive. In many developing country environments, the resource endowment will dictate small-scale, centralized enterprise. At the same time, the production of petrochemicals, steel, and other goods where the economies of scale are extremely important may require highly capital-intensive, centralized production facilities.

In sum, appropriate technology enables developing countries to provide goods and services for their people in a manner which is compatible with their economic and social conditions. They relate to national employment, output, and equity objectives as well as global goals in these and such other areas as environment and population. Basic to the concept of appropriate technology is choice. Too often feasible technologies that could better achieve objectives have been ignored or dismissed. An open and flexible attitude is the key to selection of technologies that will best achieve the objectives we all seek. 1/

While only this small section of the U.S. National Paper explicitly uses the words "appropriate technology," the thinking behind the concept is reflected in the overall ideas and attitudes of the document. The attempt to approach the subject of science and technology for development with "an open and flexible attitude" 2/ is perhaps the most evident contribution of the AT concept to the Conference.

3. National Research Council Report

When preparing its report for the State Department, the National Research Council (NRC) was instructed to address the AT issue. The treatment of the appropriate technology concept is similar to that in the

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1/ Ibid., p. 28.

2/ Idem.

U.S. National Paper. This background study defines AT as ". . . technology that is optimal for a particular situation in a particular developing nation, given that nation's economic and social conditions and goals." 1/

Discussing the issues surrounding industrialization and economic growth the authors emphasized the importance of employment. However, in defining the role of appropriate technology, the report states that ". . . there is little, if any evidence indicating that the employment problems of the developing countries are primarily [emphasis added] due to mistakes in the choice of technology. . ." 2/ However, given the additional problems faced by the developing countries in economic growth, ". . . there are examples that indicate that a greater sensitivity is needed to the effects of technological choices. 3/

The creation of indigenous innovative capabilities is suggested in the report as the best mechanism for the creation and adoption of appropriate technology. To this end, the report offers various initiatives designed to strengthen the developing countries'abilities to industrialize.

1/ NRC Report, op. cit., p. 49.

2/ Ibid., p. 50.

3/ Ibid., p. 51.

However, it is recognized that appropriate technology is not limited to the industrialization issue and that economic growth is a much broader endeavor. Thus, while not explicitly proposing the use of so called "appropriate technologies," many of the initiatives outlined in the NRC study -- especially in the areas of energy resources and production, agriculture, and health -adhere to the concepts basic to appropriate technology.

4. Additional Research into Appropriate Technology for UNCSTD

Additional input into the determinaton of a position regarding the appropriate technology concept has been obtained through consultations with AT practitioner organizations as well as through various research projects financed by U.S. participating agencies. The December 1978 Winrock workshop on appropriate technology was held ". . . to help inform U.S. policy makers and guide national policy on appropriate technology in connection with the upcoming U.N. conference . . ." 1/ An international group of professionals met to analyze and discuss AT and to prescribe recommendations for the role of appropriate technology in development. The State Department is also investigating the feasibility of publishing a catalogue of the American experience with AT to demonstrate the applicability of the concept. See the Appendix for a summary of the Winrock workshop findings.

1/ Proceedings of a Workshop: Appropriate Technology, op. cit., p. 1.

In conjunction with the activities at State, the Agency for International Development has funded four studies relating to appropriate technology. These reports are designed as resource materials for the U.S. position on AT and include: (1) "Appropriate Technology Case Histories," by the Denver Research Institute; (2) "Appropriate Technology for Renewable Resource Utilization" by the Washington University Center for Development Technology; (3) "The Relevance of U.S. A.T. Developments to the Third World," by TRANET; and (4) "Small Enterprise Technology Transfer Case Studies" by the Entrepreneurship Institute. In addition to this work, the National Science Foundation, as part of its activities connected with the Conference, contracted for two papers dealing with AT -- "Development Strategies and Technological Choices in Developing Countries" and "Obstacles and Opportunities in Technology Utilization for Development."

5. Assessment of the U.S. Position Regarding Appropriate Technology

The U.S. position concerning appropriate technology appears to be one of accepting the concepts associated with the term without utilizing the words per se. The hesitancy to use "appropriate technology" stems from popular confusion concerning its meaning and the tendency of the developing countries to assume that "AT" connotes old, discarded, second-hand technology which the industrialized nations are promoting to keep the developing world from achieving economic growth. Recognizing this sensitivity, the U.S. conference coordinators apparently are emphasizing activities to enhance the developing countries' selection of technology as well as the creation of infrastructure and institutions capable of developing indigenous technologies and adapting imported ones to meet the nation's economic, social, and political needs.

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The posture of the United States is apparently one of promoting the choice of technology to meet "basic human needs" in the developing nations. However, the U.S. National Paper is careful to explain that the satisfaction of these needs does not necessitate a trade-off with economic growth and that the two objectives can be compatible. The paper points out that "much of the official foreign assistance extended by the United States is intended to assist in meeting basic human needs -- to help fulfill the economic rights of all [people] . . ." 1/ By becoming employed, the previously unemployed and underemployed ". . . will be the mainstay of self-sustaining growth" in the developing countries, 2/ a primary goal of science and technology for development.

As mentioned above, the report of the Jamaica Symposium by the International Institute for Environment and Development has also been influential in determining the U.S. position on appropriate technology and basic human needs. The material contained in the final report supports the U.S. contention that development strategies can simultaneously alleviate poverty and promote growth and industrialization. According to the report, "much of the debate . . . over meeting basic needs versus economic growth and over 'advanced versus appropriate'

1/ U.S. National Paper, op. cit., p. 6.

2/ Ibid., p. 6.

technology is artificial. Countries need a judicious mix of each." 1/ This reinforces the views expressed in the U.S. National Paper and the position of the U.S. Coordinator's Office. (For additional information about the Symposium, see Section X. C., above.)

The information accrued concerning appropriate technology and its role in development is being synthesized into a position for the United States to take at the August conference. It is expected that the United States will support the concepts behind the term "appropriate technology" corresponding to those articulated in the U.S. National Paper. In stressing the necessity of meeting "basic human needs" and promoting the idea of the choice of technology, the development of indigenous scientific and technological capabilities, and the need for a mix of technologies in development suited to local conditions, the U.S. position has incorporated most of the characteristics associated with the appropriate technology concept. It remains to be seen if this position is accepted by the developing countries themselves or by the private interests and businesses which are integral to technology transfer in the developing world.

1/ Mobilizing Technology for World Development: Report of the Jamaica Symposium, op. cit., p. 2.

XII. DIFFERENCES IN VIEWS AMONG THE LESS-DEVELOPED NATIONS WITH RESPECT TO SOME GROUP OF 77 POSITIONS FOR UNCSTD

A. POSITIONS TAKEN BY THE LDCs AT THE U.N. CONFERENCE ON TECHNICAL COOPERATION AMONG DEVELOPING COUNTRIES (TCDC)

The developing nations have made an attempt to strengthen their position vis a vis the United Nations and the developed world and to reach harmony on their demands for developmental aid by promoting stronger functional ties among themselves with respect to science, technology, and development. These objectives are reflected in the program of action the developing countries adopted at the U.N. Conference on Technical Cooperation Among Developing Countries (TCDC), held in Buenos Aires in 1978.

The original idea for TCDC came from several developing countries, but most especially Argentina, which wanted to force a shift in U.N. procedures so that the organization would award more contracts for development services and other types of procurement to developing rather than developed countries. The conference agenda was then expanded to include recommendations that the developing countries themselves, as well as the U.N. agencies, take steps to promote development of the less-developed nations' own science and technology bases and that they seek to cooperate among themselves.

Reports of the conference indicate that recommendations were adopted for national action by developing countries and for international action to be taken by U.N. bodies.

Among the action recommendations made were the following:

- Developing countries should take steps to recognize that each country has attained a different level of development, and thus needs to establish its own priorities and programs in keeping with its own goals,

aspirations, and traditions,

- the traditional sectors of society should be strengthened while at the same time enlarging the modernized sectors of society,

- developing countries need to take immediate steps to improve their capacity to absorb foreign technology,

- developing countries need to give consideration to strengthening regional and subregional networks for information exchange, research, and training, especially to change "attitudes" necessary for modernization,

- in addressing schemes for regional cooperation, developing countries should look at the possibilities of developing vertically and/or horozontially integrated regional industrial production systems,

- the United Nations should take steps to make greater use of developing country resources when procuring supplies, equipment, services, expert consultants and volunteers for U.N. voluntary projects.

Most of the work at the U.N. on TCDC is being done by the U.N. Development Programme. It recently initiated publication of a periodical, TCDC News, to inform LDCs about U.N. activities related to the objectives of TCDC and to serve as communications vehicle among participants. 1/ The United Nations has also published a number of reports reports describing how U.N. agencies are responding to the recommendations made at the TCDC. 2/

1/ The LUND Letter on Science, Technology and Basic Human Needs, No. 11, March 1979: 8.

2/ See for example: United Nations Development Programme. Technical Cooperation Among Developing Countries. Report of the Administrator. March 27, 1979.27 p. (DP/373.)

Although UNCSTD preparatory documents allude to the importance of the TCDC, nothing seems to have been issued to describe how UNCSTD actions will be intended to harmonize with the outcome of the TCDC. Also, since the TCDC recommendations are more general and hortatory than concrete and specific, it remains to be seen whether they will provide the basis for cooperative action among the LDCs who publicly invoke visions of alliance and cohesiveness, but in actuality find it difficult to cooperate in regional economic, political, scientific, or technological mechanisms.

B. HETEROGENEITY OF DEMANDS OF THE GROUP OF 77, DEPENDENT ON LEVEL OF DEVELOPMENT

Publicly during UNCSTD "prepcoms," the Group of 77 nations has maintained a unified stance (typically opposed to the developed nations) in order to obtain negotiating strength. But it is apparent that the Group of 77 is not a homogenous entity and that nations have different opinions and reactions to the draft program of action promulgated by the Group of 77 caucus leaders. Such maneuvering, of course, causes confusion for diplomats of most nations, but may at the same time provide an opportunity for negotiators from the developed countries to take advantage of the differences of opinion in the Group of 77 to force moderation of some of the more extreme developing country demands.

The divergence between developing nations varies with their level of development. The more advanced members of the Group of 77 have achieved moderate levels of industrialization. Many of them, especially some Latin American nations, have surpassed the import substitution phase of industrialization and seek to expand capacity to export products on the world market. Thus, they favor UNCSTD agenda items that would hasten industrialization,

restructure ownership and control of intellectual property and technological operations, and create high-level bureaucratic planning or science policy bodies in the United Nations.

The less-developed members of the Group of 77 have not attained similar levels of industrialization and are still primary product exporters. Their rate of economic growth ebbs and flows with demand for natural resources products. Typically they have a minscule entrepreneurial sector and little venture capital to invest in industrialization. Generally these nations' UNCSTD demands encompass policies designed to seek practical results to feed, house, clothe and improve the health conditions of their populations. They favor policies to promote the growth of: economic and scientific and technological infrastructure, of small-scale research centers, agricultural and rural development assistancea and basic educational skills.

It is generally acknowledged that the "Latin American group," led by delegates from the Andean Pact countries dominates the UNCSTD sessions as well as the Group of 77 caucus within UNCSTD. They seek rules, procedures, institutions, and processes for controlling industrial property and technology. As a result some African, Asian and less developed Latin American nations seem to believe that UNCSTD discussions diverge from their developmental needs since these nations prefer to discuss specific substantive applications of science and technology. For instance:

> . . . In Africa . . . matters [of importance to the Latin American countries] take second place to the more fundamental problems of education and training, capital investment in laboratories, and particularly institutional reform, which will underpin their industrial revolution. One African delegate stressed how essential it is to train scientists and technologists to handle technology transfer before it takes place, and said that . . . [the Group of 77's Target Area A paper] . . . did not talk enough about these problems.

> . . . Nor is there any discussion . . . of how the Third World should set research priorities, limited as many budgets are by funds and manpower, or how to apply this basic research to obtain some practical results. Another problem, particularly important to Africa is ignored by the Group of 77, . . . is one of population distribution. The group's declarations so far do not answer the question of how higher education institutions teaching science, or technical colleges for highly specialized courses, can be set up in countries with a very small population, perhaps less than a million. 1/

The LUND Letter on Science, Technology, and Basic Human Needs and articles in the New Scientist, fault the "prepcom" documents for neglecting to "group countries, to see where political alliances are forming and to identify the main areas of potential conflict." Plans for development, they say, must account for differentials among nations according to size and levels of economic development. 2/

Ideological and practical differences notwithstanding, one reporter attributed Latin American domination of the Group of 77 to the fact that African and "fourth world" countries could not attend regional meetings held before the UNCSTD "prepcoms" because the developed nations refused to vote extra U.N. funding for travel to the Conference preparations, which are estimated to cost about $13 million. Therefore, reportedly, the poorest of the developing countries have been underrepresented. 3/

1/ UNCSTD File: A Conflict of Interests. New Scientist, May 10, 1979:450.

2/ Stephanie Yanchinski. UNCSTD's Action Program Off-target. New Scientist, v. 81, Feb. 1, 1979: 330.

3/ A Conflict of Interests, op. cit.

C. DIFFERENCE IN VIEWS AS A RESULT OF PHILOSOPHICAL AND IDEOLOGICAL DIFFERENCES

Ideological or philosophical views about the importance of technology to growth have also caused differences among nations. Some believe that technology transfer will increase the dependency relationship between developed and less-developed nations. Efforts to increase or improve the technology flows to developing countries are simply "new wine in old bottles," since they will tend to exacerbate the traditional relationships of domination, paternalism and exploitation by developed over the less-developed nations. 1/ One developmental economist/ sociologist, Johan Galtung, argues that since developed countries have a comparative advantage in research and development, the ". . . indiscriminate transfer of technology is '...structural and cultural invasion; possibly of much larger significance than colonialism and neo-colonialism . . . .'" 2/

Two experts who have followed UNCSTD since its inception, Ward Morehouse and John Sigurdson suggest that UNCSTD impose a 10-year moratorium on the import of new technology to the LDCs, while at the same time removing all restraints on the free flow of existing technical/ proprietary information:

1/ Vokler Rittberger, and Geneva Tubingen. The Role of Science and Technology in the New International Order. Intereconomics, no. 11/12, Nov. - Dec. 1978: 286.

2/ Ibid., p. 286.

Morehouse and Sigurdson, seeing a 'circle of continued dependence on foreign technology inhibiting the development of an autonomous capacity for technological change,' propose that serious consideration be given to the debate on implementing two contradictory measures: (1) declaration of a 10-year moratorium on new transfer of technology from industrialized to developing countries; (2) removal of all constraints on technology transfers including patents and other restrictions on proprietary technology. 1/

Such a plan would achieve the objectives of permitting benign technological growth in developing countries, while at the same time halting the indiscriminate growth of MNC operations in the developing countries, bottling up the profits which would normally accrue to investors in foreign technological ventures. 2/

Opposition to such proposals is legion: without MNC operations, some developing countries would not be able to accumulate venture capital needed to industrialize. Developed nations reject the notion on the grounds that it would be detrimental to world trade and cause such an excessive halt in the growth rate of the world's economies as to cause rapid depression.

As a moderate alternative to these schemes, proposals have been made to promote specific types of industrial technology transfers and scientific and technological cooperative ventures appropriate for the social and political environment of partners to the transaction. Thus according to Ritterberger and Tubingen:

1/ Idem.

2/ Vinod Vyasulu. Science and Technology for Underdevelopment. New Scientist, Jan. 18, 1979: 183.

> . . . Two possibilities come to mind: Firstly, one could focus on areas for scientific - technological cooperation in which developing countries have already reached a sufficient level of competence and expertise. Secondly, in other areas, cooperative programmes and projects would be linked to promotional schemes which provide for raising the level of competence of participating scientists and technologists in developing countries up to that of their partners from developed countries in the course of implementing the programme or project. 1/

D. SOURCE OF DOCUMENTATION ON DIFFERENCES IN VIEWS AMONG MEMBERS OF THE GROUP OF 77

It may be important for negotiating purposes and substantive debate to know the precise lines of demarcation between Members of the Group of 77 regarding the draft program of action for UNCSTD.

The most comprehensive and up-to-date review of such positions probably will be the NSF computer analysis of demands of developing countries as enunciated in national papers. As of July 20, 1979, the document had not been finished. Reportedly, it will categorize demands of nations according to their level of socio-economic development.

See Section IX. H. 2. b. above for additional details about preliminary conclusions of the survey.

1/ Ritterberger and Tubinger, op.cit.: 286.

XIII. CONCLUDING REMARKS

Some observers have commented that the outcome of the discussions at Vienna will not spell success or failure for UNCSTD since many of the Conference's objectives have already been met during the two-year preparatory period. Participating nations and regional groups have undertaken massive efforts to inventory their science and technology development-related resources and needs. Scientists have assessed opportunities for nongovernmental collaboration with colleagues in the developing countries. Some industrialists, while arguing for maintaining the sovereignty of property rights, have begun to look at ways that multinational corporations might modify operations to create conditions which coincide more closely with some developing country demands.

From this perspective, the UNCSTD preparatory activities have served to catalyze efforts which, hopefully, would continue with a momentum of their own after the Vienna meeting ends.

Other observers, however, would say that more should be expected from the Conference, its preparatory activities, and the Vienna deliberations.

The U.S. Government, the American nongovernmental scientific community, and significant interest groups have devoted much time and effort to preparations for UNCSTD. Nevertheless, and despite the considerable efforts of the U.S. Coordinator's Office in the State Department, the Executive Branch apparently has not found it

easy to reach consensus on firm policy directives for the conference. The United States national paper, prepared for the UNCSTD, stresses promoting the policy and programs goals of infrastructure growth and capacity building in developing countries. It calls for increased bilateral and multilateral cooperative research on global concerns relevant to all nations --- developed and developing. And it proposes creation of a Foundation for Technological Cooperation (now called Institute for Scientific and Technological Cooperation) to develop a new mechanism to furnish U.S. developmental aid and to cooperate in development-oriented scientific and technological research with the middle-level developing countries.

Some Americans and foreigners alike describe these program and policy objectives as too diffuse, as well as too different from the demands made by many of the developing countries in the papers they prepared for UNCSTD and as reflected in discussions at the preparatory meetings.

The poorest of the developing countries apparently seek U.S. program initiatives for additional or collaborative research and development efforts in substantive policy areas which would meet their requirements for fulfilling "basic human needs" -- food, population control, housing, energy use, etc. Although the United States is expected to offer proposals in these areas, as of July 20, 1979, one month before the Conference, Executive Branch decision-makers, who have been trying to work out program initiatives for about two years, still had not reached agreement on what U.S. initiatives should be presented in these areas.

Indications are that U.S. programmatic initiatives will stress improving collaborative research programs in energy and natural resources utilization and conservation.

The delay in U.S. policy forumulation efforts might be attributable to four factors:

- the low priority given to foreign development issues in the presence of major domestic economic and social problems,

- a virtual absence of funding for new programmatic initiatives in either domestic or foreign policy,

- a possible lack of appreciation for the importance of science and technology to development and its relationship to the demands enunciated in the calls for creation of a "New International Economic Order," and

- distance between the demands of the Group of 77 and concessions likley to prove acceptable to the U.S. polity.

Many of the most developed of the Group of 77 nations that dominate the UNCSTD preparatory activities do not share the urgency and views of critics who see a need for the United States to make firm commitments now for expanded or new programs in specific substantive areas. They have different expectations for the outcome of UNCSTD, which they perceive as a forum for presenting and achieving a restructuring of the international processes, procedures, and institutions for the ownership and goverance of science and technology. The more industrialized --- and the more radical of the Group of 77 countries --- seek four fundamental objectives to be achieved at Vienna. Only when these objectives are achieved, they say,

will the developing countries be ready to discuss science and technology applications or collaboration in specific substantive areas.

The fundamental demands of the Group of 77 are:

- creation of a $2-4 billion development fund in the United Nations, controlled by the developing countries,

- a legally binding code of conduct for technology transfer,

- restructuring of the U.N. to create a new body to coordinate and administer U.N. science and technology activities, and

- creation of a global information system, providing free or low cost access to most of the world's public and private scientific and technical information.

The United States and most developed nations reject these demands. They prefer a development fund controlled by the existing U.N. Development Program, which is not dominated soley by developing nations, and which would force recipient nations to predetermine sectoral applications or priorities before being awarded funds. They also object to the "automaticity" of allotments required in the Group of 77 proposal. Developed nations favor a voluntary code of conduct for technology transfer and want all discussions of these matters deferred to other international forums created to deal with these mattters. They object to creation of a new U.N. agency, without first attempting to improve what they describe as the chaotic management practices of current U.N. science and technology efforts. And, of course, they object to demands for access to proprietary information and want to see developing countries

make an effort to insure use of information before creating elaborate new mechanisms for information exchange.

Although the United States seems to have played a cautious, reactive role in preparatory discussions for UNCSTD, it may find an opportunity to take the initiative in promoting policy initiatives at Vienna. The United States seeks to insure that the Conference participants recognize that bilateral and multilateral programs should be designed with sufficient flexibility to aid nations with vastly different levels of socio-economic development. The Group of 77, while united publicly, has displayed considerable fragmentation in private discussions. Differences of opinion center on the amount of attention to be devoted to the "technology transfer" concerns of the most developed of the Group of 77, versus the "basic human needs concerns" of the least developed members of this group. The Group of 77 will meet in Bucharest for a few days before the UNCSTD meeting to further refine its position. However, any serious fragmentation in the group may provide an opportunity for the world's developed nations to negotiate a moderation of the more extreme of the Group of 77 demands. For the United States, this seems to be a feasible approach that could be made to satisfy the goals of creating processes to promote the use of science and technology for development while at the same time recognizing the importance of national and proprietary interests.

Appendix I. "Overview and Proposed Initiatives from U.S. Science and Technology to Development: A Contribution to the 1979 U.N. Conference. Prepared by the National Research Council.

Source: U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference. Background Study on Suggested U.S. Initiatives for the U.N. Conference on Science and Technology for for Development, Vienna, 1979. Prepared by the National Research Council. Washington, U.S. Government Printing Office, 1978, pp. 1-38.

U.S. Science and Technology for Development:

A Contribution to the 1979 U.N. Conference

Background Study on Suggested U.S. Initiatives
for the U.N. Conference on Science
and Technology for Development, Vienna, 1979

Prepared by

NATIONAL RESEARCH COUNCIL

- National Academy of Sciences
- National Academy of Engineering
- Institute of Medicine

Printed by
Department of State

This report, "U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference," was prepared by the National Research Council, a private organization. The Department of State asked the Council to suggest activities that the U.S. government might consider--for increased support within available resources--as means of helping developing countries apply science and technology in support of their own development programs. This report is neither a statement of U.S. government policy nor a recommendation by the National Research Council that the entire range of suggested activities should or could be supported by the U.S. government.

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine. The members of the Committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Stock Number 052-003-00546-8

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Chapter 1

OVERVIEW

President Carter has called for a renewed American dedication to helping developing countries meet the needs and aspirations of their people. In this, Americans are motivated by a desire to help build the kind of global environment in which the conditions for liberty and equity can grow and in which U.S. interests can best be protected. Further, they are motivated by a humanitarian sensitivity to the needs of the poorest people.

The United Nations Conference on Science and Technology for Development will ask how science and technology can better serve socioeconomic development. The growth of scientific and technical capabilities in developing countries over the past three decades offers new opportunities to create cooperative international relationships for this purpose. Growing recognition of common global interests and concerns offers a basis for sustaining such relationships.

The United States and other developed countries are increasingly concerned with development collaboration. Nevertheless, multilateral and bilateral assistance continue to play a significant role in helping developing countries strengthen their own institutions. Both development assistance and development collaboration are parts of an overall pattern of mutually beneficial relations which includes trade and other forms of exchange. Certainly, scientific and technological activities are an important part of that pattern. U.S. strengths in these fields are widely admired and sought after by developing countries. The private sector--including universities, nongovernmental organizations, and private industry--will continue to play a particularly useful role.

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AREAS OF CONCERN

One constructive effect of preparations for the 1979 Conference is that the U.S. government has begun a systematic review of what it can do to improve the U.S. scientific and technological contributions to development. This report, designed to assist those preparations, proposes initiatives that could be components of such a program.

These initiatives were selected from a much larger list considered by our panels. Most involve additional actions of types already undertaken or actions that have already been discussed elsewhere. We have sought to provide the U.S. government with a wide range of initiatives, each of which would have a strong positive impact on development. From these, the government can select those it wishes to pursue in the context of the 1979 Conference.

In our search for initiatives, we have kept several factors in mind: (1) the needs and priorities of developing countries, as we understand them; (2) their special concerns, including the desire for self-reliance and greater autonomy in the management of their affairs; (3) potential mechanisms for transferring and adapting foreign technology to conditions found in developing countries; and (4) ways to help developing nations both draw on world science and technology in devising answers to their own problems and contribute to the world experience used by all countries.

Once the U.S. government selects those initiatives it is best able to pursue, and how far, in light of financial and other feasibility factors, it will need to work out the particulars that will make them into operational proposals. Our Committee was not in a position to do this, but we note that the initiatives vary greatly in their cost implications. Many suggestions would call mainly for adjustments in policy and orientation of existing activities. Others would require substantial additional public appropriations, the magnitude of which can be varied. The Administration has expressed its desire to increase substantially the U.S. development assistance program, and we believe that this list of initiatives provides many opportunities to put such funds to good use. However, we note that the total list is very extensive, so that selection to hold within feasible cost limits will be essential.

We note that the phrase "developing country" is inexact. Each country has unique scientific, technological, and development needs. Moreover, developing countries are showing a growing interest in interregional cooperation. Thus the United States must

be prepared to offer and participate in programs that aim at a wide range of needs, appeal to different countries and regions, and are also responsive to the varied interests and capabilities of people and institutions in the United States.

The Goals of Development

Broadly speaking, development is concerned with two important goals: (1) eradication of extreme poverty by satisfying the most basic needs for food, shelter, health, employment, and education; and (2) modernization and growth of national output both for domestic consumption and to earn income through export.

Scientific knowledge and technology are an indispensable part of the development process. Yet, they are only two elements in a larger setting where political, social, and economic traditions, values, and processes may be more fundamental factors affecting change.

The experience of the past quarter century has shown the limitations of equating growth with development. Many developing countries have successfully raised their gross national products, increased food supplies and educational opportunities, and improved health and living conditions. Yet millions of people remain little affected by these successes, necessitating new and different measures to bring these benefits to the poorest people.

Quality of life and quantity of output are, however, closely related. Low-income countries cannot overcome the worst aspects of poverty without raising average output and income per capita; this fact has led most to drive for industrialization and more substantial access to the world's industrial technology. The thorny issues raised by these desires are discussed in Chapter 2. In developing countries, fear of exploitation by transnational corporations that control much of the science and technology needed for industrialization is matched, in developed countries, by fear that exports of industrial technology will result in loss of jobs and markets. There is no easy resolution of these issues, but the 1979 U.N. Conference can provide an important opportunity for generating greater common understanding of the problems involved.

Autonomy and Interdependence

Developing countries often identify autonomy and self-reliance in the management of their own affairs as

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primary development goals. Implicit is a desire to reduce dependence on outside sources for modern technology. At the same time, there is a demand for greater access to technology held in the developed countries and better terms for its importation.

These are legitimate and important concerns. Continued gross disparity in scientific and technical capabilities between developed and developing countries is not in the long-term interest of either. The spectacular growth in world trade after World War II, thanks in good part to U.S. help in rebuilding war-devastated Europe, testifies to the gains for all sides to be had from self-reliant economies. Strong economies in developing countries could support similar growth worldwide.

The drive for greater autonomy in developing countries involves contradictions, however: self-reliance is not equivalent to self-sufficiency. Fulfillment of aspirations for material progress normally leads to increasing interdependence among countries, since no country is entirely self-sufficient in the resources needed to achieve its goals.

Global problems also foster interdependence among countries. The scarcity of petroleum, minerals, and usable water resources, for example, affects world agricultural and industrial production and distribution. Growing world population is putting new demands on the world's ability to produce food, jobs, and services. Many environmental issues are global in nature. Furthermore, as populations multiply and improvements in communication and transport spread, people everywhere are affected more and more by actions taken beyond their borders. Thus it is important to foster cooperation among countries while at the same time promoting sustainable, more self-reliant growth in developing countries.

Technology Transfer and the Problem of Proprietary Knowledge

Technology is transferred from the United States to developing countries by many routes, via universities, laboratories, visiting experts, books, journals, technical reports, and the like. Much, especially industrial technology, is transferred through commercial firms in the form of products and processes.

Commercial transfer of technology often involves proprietary knowledge, available only on terms negotiated with the owners of the technology being sought. In the private enterprise system of the United States and most industrial countries, the ability to protect private skill and information is an important

incentive for economic performance and technical advancement. We do not anticipate any basic change in U.S. laws relating to this protection.

A small fraction of U.S. industrial and commercial technology will continue to be withheld for reasons of national security or commercial secrecy. However, most proprietary technology can be purchased, and developing countries are increasingly adept at negotiating better terms for it. In any case, it seems clear that the extent of private technology flows to developing countries will depend on whether conditions in each country (markets, regulations, institutional and business capabilities, and so forth) attract such flows. At the same time, the United States should be alert to opportunities for encouraging U.S. private enterprise to negotiate such exchanges on terms that would facilitate broader participation by developing countries.

One important point is that much U.S. technology is nonproprietary in the sense that fees need not be paid for its use--a fact that the United States may have done too little to make clear. Much technology is published. Other freely available technology includes that embodied in expired patents that have never been brought to large-scale commercialization but that may, because of changing circumstances (e.g., increased energy costs or decreased supplies of raw materials) be newly attractive. The substantial amount of technology developed with U.S. government support is normally in the public domain. Nonproprietary technologies include, for example, a large segment of industrial and communications technology, and most of those used in public services, construction, transportation, health, and agriculture. The latter areas may be the sectors in which actual yield on investment, in terms of improved living standards, will be greatest.

Universities, government laboratories, and industries generally are prepared to cooperate in adapting or transferring this technology, and the United States, by way of the Agency for International Development (AID), has actively supported its transplantation, with particular concern for adaptation to conditions in developing countries.

Of paramount concern, however, are the developing countries' own capabilities to assess, select, develop, adapt, and apply technology and the underlying scientific knowledge. Thus throughout this report, we stress measures that would help build these capabilities.

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OPPORTUNITIES AND PROPOSED INITIATIVES: HIGHLIGHTS

The initiatives identified in this report fall into two categories: (1) those that relate to specific clusters of development activities, and (2) those that help strengthen the general abilities of developing countries to make use of science and technology for national purposes. The first 16 initiatives in this chapter highlight those in the first category that seem to this Committee to have the highest priority among the many discussed in later chapters. They relate to:

-- increasing food supplies,
-- health and related needs,
-- urbanization and industrialization,
-- management of resources.

The remaining initiatives identified in this chapter fall into the second category, that is, they relate to the general abilities of developing countries to use science and technology. This list does not, of course, exhaust the total of potentially useful initiatives. Many more are outlined in subsequent chapters; still others were raised in public forums and elsewhere.

The problems we have identified for concentrated effort share three attributes: (1) successful work on the problem would have a broad impact on development and human welfare, especially on the poorest sectors in developing countries; (2) developing and developed countries have a mutual interest in collaborating on the problem; and (3) the scientific and technical knowledge needed for addressing the problem is available or foreseeable. Any U.S. initiative proposed at the U.N. Conference needs to be judged against all three criteria if it is to be well received at home and abroad. Moreover, the policies and actions of each country set the directions and pace of its development, which normally is affected only marginally by outside initiatives. However, international collaboration, such as the initiatives listed below, can be decisive in dealing with key problems.

Increasing Food Supplies

Increased crop production to feed the world's growing population can be achieved either by expanding the land area cultivated or by increasing average annual yields per hectare. The latter may be accomplished by applying more labor per hectare, applying more capital per hectare (in the form of fertilizers, equipment, irrigation ditches, etc.), improving the biological factors that affect crop productivity, or making other technological improvements.

Problems abound in this area. The costs of bringing land into production continue to rise, and the expense and environmental damage associated with production inputs constrain their use. People are beginning to question the wisdom of building ever more irrigation dams and using ever greater amounts of chemical fertilizers to grow crops. However, as the following initiatives suggest, important gains in world food supplies are possible via other routes including the reduction of postharvest food losses, more efficient management of tropical soils and water at the farm level, and better plant and animal protection. Furthermore, there is a good prospect that scientific research may, in the long run, develop crop plants that are inherently more productive than those now available.

1. Reducing Postharvest Food Losses

Conservative estimates of the amount of food lost between harvest and consumption as a result of pests, microorganisms, inadequate storage, poor processing techniques, and the like, range upward from 10 percent for grains and legumes and 20 percent for perishables. A campaign to reduce or prevent these losses could thus result in a major increase in world food availability with minimal disruption of familiar production techniques and existing socioeconomic arrangements.

The problem of postharvest food losses is well recognized. In 1975, the Seventh Special Session of the U.N. General Assembly proposed priority efforts to reduce postharvest losses by at least 50 percent by 1985. We believe that the United States should allocate more resources to this goal. In addition, we recommend that the United States encourage the formation of an International Coordinating Council on Postharvest Food Losses to provide a forum in which coordination could be worked out among presently scattered activities in the United States and elsewhere. The council could support or foster development of loss assessment methodologies; strengthen information exchange; encourage scientific and socioeconomic research; promote training programs; identify or develop useful low-cost equipment; and encourage other public and private institutions to contribute funds or expertise to this effort.

Many known techniques for reducing losses can be adapted for use at the farm level if trained personnel and other resources are made available. Thus rapid impact could be expected, contributing to a reduced

incidence of absolute hunger, higher levels of nutrition and health generally, and, with appropriate marketing policies, added income for rural populations. Demands on governments to expend foreign exchange to import food or fertilizer might also be reduced.

2. Soil and Water Management at the Farm Level

Both soils and water can be used more efficiently to increase food production. Over half the world's arable land is used sparsely, or not at all, for agriculture. Most of this unused potential is found in the tropics and often has characteristics unfavorable for steady cultivation, e.g., high acidity or high levels of mineral toxicity. At the other extreme, about half of the world's food production, by value, comes from irrigated land. Yet on this land, water is often poorly managed, leaving great room for improvement. Irrigation projects have frequently failed to meet expectations because the delivery, distribution, and drainage of water on farmers' fields are uneven, wasteful, poorly timed, and conducive to waterlogging and salinity.

We recommend that the United states indicate its willingness to respond to requests from developing countries and international organizations in two areas: (1) management systems for sustained crop production on tropical soils, and (2) water management for irrigation. The United States has strong capabilities in both areas. For many years, the U.S. Department of Agriculture (USDA) and other government agencies have worked on similar problems in this country, while AID and others have had extensive experience with these problems abroad.

With respect to management of tropical soils, the United States could offer to increase U.S. participation in joint research, education, and training activities that would develop and demonstrate appropriate management practices; strengthen the capabilities of the AID-supported consortia of universities which have in-depth expertise and worldwide contacts and cooperative activities in this field; support international initiatives to expand and strengthen the evolving informal international network working on problems in soil management; and assist, where requested, in building developing country capabilities in this field.

Similarly, in the area of farm-level water management, the United States could offer to expand bilateral financial and technical collaboration with developing countries; encourage ties between international financing for new irrigation projects and

progress in improving water management at the farm level; support stronger programs by the Food and Agriculture Organization of the U.N. (FAO) in this field; and encourage international collaboration among organizations working on research and technology transfer in this field. In this area, as in many others, judicious use of relatively small assistance funds for communication functions or common services could catalyze much larger programs financed out of the budgets of participating organizations to advance their own program interests.

3. Plant and Animal Protection

Fewer than 100 species of plants and animals provide more than 95 percent of the world's food supply. But their productivity, quality, and performance are threatened by more than 25,000 species of bacteria, fungi, viruses, nematodes, insects, rodents, birds, and weeds.

Intensive research in the United States and other countries has identified many of these pests and has led to the development of several types of control technologies, including: breeding of pest-resistant crop cultivars and livestock strains; biological control through parasites or disease organisms that prey on specific pests; safer, more efficient chemical pesticides and application methods; production and harvesting techniques that minimize pest damage; animal inoculations, vaccines, and pesticide dips; and prevention, through better sanitation and more nutritious animal feeds. Integrated pest management combines the most advantageous of these practices for a specific situation.

Possibly no other area of technical assistance has been as favorably received by farmers and herdsmen in developing countries as has protecting crops and livestock from harmful pests. However, excessive use of long-lived or inappropriate pesticides has sometimes resulted in injury to farm workers, evolution of insecticide-resistant pests, reduced yields, and contamination of nearby food crops and animals. Further, in some areas the ecological balance has been upset, so that previously minor insects have become primary pests.

New pest control practices and new chemicals, equipment, and application procedures are continually evolving from agricultural research centers and industrial laboratories. These research results need to be adapted to varying local conditions and used more effectively in practice. Thus we recommend that the United States offer to collaborate with interested

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developing countries to train personnel and develop innovative programs for developing and promoting appropriate, location-specific pest management systems for both crops and livestock.

An important complement to this initiative is U.S. technical assistance related to the environmental effects of pesticide use which concern health, agricultural, and environmental officials in many regions. We recommend that the United States enlarge its assistance to departments of entomology in developing country universities, work with government officials on ways to minimize environmental problems associated with pesticide use, and help make available information on the efficacy and effects of alternative pesticides in terms that are easily understandable to governments, formulators, applicators, and farmers.

U.S. pesticide manufacturers should be encouraged to provide on-the-job training for local technical personnel and to supplement AID efforts in other regards. For example, exporters could be required to furnish importers with detailed, easily understood information on toxicology, safe methods for use, and appropriate warnings about the effects of misuse. Also, all development agencies should be encouraged to develop better means of predicting the environmental effects of their programs.

Finally, we recommend that the United States support more complete worldwide collections of (1) germ plasm, especially for crop varieties that have unique resistances to specific pests, and (2) organisms injurious to crops and livestock. U.S. computer capabilities could be used more widely in developing worldwide information banks and diagnostic services in these fields.

4. Overcoming Biological Limits to Plant Productivity

Over the long term, sustaining the increases in food production necessitated by a burgeoning world population will depend increasingly on making crop plants themselves more productive. Large, unexploited possibilities still exist for applying available breeding techniques and further identifying the genetic potentials of various crop plants. However, the rate of increase in crop yields by hybridization will decline over time unless some of the fundamental biological limits to plant productivity are overcome.

Accomplishments in identifying further genetic potentials have been quite limited to date. Indeed, evidence suggests that the highest yields of rice and wheat yet obtained may be close to the biological ceilings as perceived by present levels of knowledge.

But there are indications that basic research can substantially reduce some of the fundamental biological limits to plant productivity, which can then be translated into higher yielding varieties.[1]

Recent reports suggest that three interdependent basic research areas are particularly promising for crop plants: (1) increasing biological fixation of nitrogen, (2) increasing photosynthetic efficiency, and (3) developing more powerful tools for genetic manipulation. Since the major impacts of this research are likely to be realized only after 15 to 25 years of effort, this work needs to be sharply accelerated now in order to bring results to farmers' fields before production increases from other means level off. Aside from the long-term payoffs, important benefits are likely in the short and medium term. For example, work on new genetic tools has already produced techniques for screening plant varieties and storing germ plasm more efficiently, which could accelerate advances from conventional plant breeding.

Work to expand the science base for increased global crop production is a strong suit for the United States. Many research leaders in developing countries recognize this and hope for U.S. progress. Thus we recommend that the United States (1) indicate its intent to accelerate basic research in the three areas mentioned above; (2) note the major benefits this is likely to bring for all countries, especially developing ones; and (3) report that U.S. research and international collaboration in this area has already begun to intensify.

Health and Related Needs

Although health is among the most basic of human needs, it is a need that is frequently unmet in developing countries, except for the small minority of people with access to modern hospitals and well-trained doctors. U.S. investments in improving the health of the poor majority and in the related fields of nutrition and population should thus have high priority.

As the initiatives proposed in this section suggest, more research is needed--for example, on ways to control infectious diseases common in the tropics and on biomedically oriented approaches to the development of new contraceptives. But perhaps the greatest gains can be made from research and development looking toward improving systems for delivering safe, clean water and providing primary care in health, nutrition, and family planning at reasonable costs.

5. Delivery of Primary Health Care

The provision of reasonably accessible and economical basic health, nutrition, and family planning services for the world's poor deserves very high priority.

We propose that the United States encourage expanded international support for efforts to demonstrate effective approaches to providing these services widely and at low cost. Such programs, to be carried out in cooperation with countries that make the domestic policy commitments deemed essential to success, would emphasize preventive services (including nutrition, family planning, and environmental sanitation), relatively simple technology, and extensive use of community health workers and other paraprofessionals, along with intensified training for physicians in delivery of primary health services. Many small-scale programs along these lines have worked well, but, with such notable exceptions as those in the People's Republic of China and Cuba, few have been effective on a large scale. Most of the trials have something to teach, but systematic attempts to learn from experience have been too infrequent.

We recommend, therefore, that the United States (1) offer to expand its cooperation in such demonstrations in selected developing countries; (2) establish an experimentally oriented small grant program, channeled through U.S. universities and nongovernmental organizations, to seek needed technological innovations and to promote education, training, and community health programs in developing countries; (3) enlarge its complementary bilateral support of improved health planning and management, including information and evaluation systems; and (4) support international research programs studying the relationships between actual diets and physical growth, mental development, fertility, and other key elements of human performance.

Although the United States has not yet been able to provide adequate health care for all its people, and although many doctors and health officials in developing countries follow the high-technology, hospital-centered, curative approach commonly found in this country, it appears that the United States can usefully contribute more to improved health delivery worldwide. This country has a wide range of the requisite technologies and management skills, and experience working in developing countries. It can also benefit from insights generated in other countries on how primary health care can be provided more effectively to whole populations.

6. Pure Water and Waste Treatment

A major hazard to the health and well-being of most people in developing countries is the horde of infectious agents in their environment, most of which reach them, directly or indirectly, via contaminated water or because not enough water is available for household and personal hygiene. More than half the world's population has no reliable and safe water supply; 70 to 80 percent has no sewage disposal. Furthermore, women and children spend hours hauling water from distant sources, using time that might otherwise be spent on more productive activities. An overall problem is the growing competition for scarce water resources among many essential uses.

Despite the availability of engineering capability in developing countries and substantial international interest, relatively little gain has been made in providing adequate supplies of safe water to village households or most metropolitan areas of developing countries. More effective systems are needed for assessing available water supplies, conserving their use, and influencing their distribution and methods of use. The selection of appropriate water system technologies by developing countries--systems that can be maintained and operated effectively with local resources--would stretch scarce capital, allowing more water systems to be constructed and successfully operated.

We recommend that the United States offer to expand its bilateral programs and cooperate in international programs to provide, at acceptable costs, adequate quantities and quality of water for human use in rural and urban areas. This could include: (1) expanded assistance in development of methodologies for identifying appropriate water and waste system technologies and adapting them to local situations, including technologies for industrial waste disposal; and (2) collaboration for improvement of available methodologies for water supply planning and management. The latter could include research on how different types of improvements in water and waste systems affect health and economic development.

Collaboration could also be offered in developing comprehensive, long-range plans for integrated water resource management, including: collecting data on water availability and quality; forecasting demand in different sectors; analyzing the adverse effects of existing uses of water resources; developing techniques for adjusting to variations in water supplies; and evaluating the comparative costs and benefits of using alternative or new technologies, including the techniques of recovery and recycling. In support of

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these activities, the United States could encourage the exchange of information on programs, technologies, and personnel in the field of water resource planning and management, and assist with short-course or on-the-job training in this field.

7. Controlling Infectious Diseases of the Tropics

The impact of infectious diseases in developing countries is enormous. For example, up to 25 percent of African children under five years old die of measles or its complications, and many others are left partially blind or otherwise handicapped. Control of endemic malaria has halved infant mortality rates in some countries.

Infectious diseases fall into roughly three categories with respect to the knowledge and resources needed to deal with them. The first category includes diseases such as malaria and schistosomiasis, for which existing control methods have only limited effectiveness. Control of these diseases will require more extensive research at both the laboratory and field levels. In the second category are diseases such as measles and some nutritional deficiencies, where the chief problem is more effective delivery of control methods that have already been developed. Cholera, diarrhea, and typhoid, among others, are a third category of diseases which are exacerbated by malnutrition, large and poorly spaced families, and unsanitary living conditions. Here innovation in medical technology is less important than social change and progress in providing pure water. An important need is for more social science research on involving communities in new forms of health-related activities and developing more effective delivery systems for preventive health information.

To provide a focus for research on these problems, we recommend that the United States create a new, highly visible program to improve understanding, prevention, and treatment of the infectious diseases of the tropics. Such a program could be established either by creating a National Institute for Infectious Diseases of the Tropics, or by providing an appropriate mandate and funding for an intensified program at the National Institute of Allergy and Infectious Diseases, one of the National Institutes of Health (NIH) which already has many of the relevant research capabilities. In either case, the program would deal primarily with the needs of developing countries, although U.S. benefits would include protection of U.S. citizens working or traveling abroad, reduced need to deal with infectious infestations from abroad, and advances in

basic knowledge about immunity factors that play a role in such diseases as cancer.

This program might, for example, support research on long-term immunization against malaria and various parasitic diseases; heat-stable vaccines for diseases such as measles and malaria; simplification of the BCG vaccination procedure for tuberculosis; new products and packaging for oral rehydration, particularly for children with cholera and other severe diarrheas; and delivery mechanisms in areas without electricity for immunizations and medications that presently require refrigeration. Much of this work would be done most effectively in developing countries. Thus U.S. research support should achieve some balance between support of domestic institutions and their subsidiaries abroad and the development and strengthening of institutions in developing countries.

Alleviation of the priority diseases will probably require investment of a decade or more in research and clinical trials before advances can be applied on a wide scale. Therefore, a buildup of trained personnel is needed in the United States as well as in developing countries to form an expanded next generation of laboratory researchers, epidemiologists, and program planners and managers. Investment of fiscal, human, and organizational resources in biomedical research issues should not, however, detract from investment in basic health, nutrition, and family planning delivery systems in developing countries, which are of equal or higher priority.

8. Improved Contraceptives

Greater support for basic, biomedically oriented contraceptive research at U.S., international, and developing country institutions would benefit both developed and developing countries. Present methods, although much improved over past ones, are far from satisfactory; all have drawbacks due to inconvenience of use or delivery, medical complications, lack of adaptation to specific country situations, or lack of cultural or moral acceptability.

Improved contraceptive technology was given high priority in the World Population Plan of Action adopted unanimously by 135 nations at the U.N. World Population Conference in 1974. More recently, the reproductive sciences and contraceptive development were systematically reviewed by more than 160 experts from 26 nations. Their report called for a significant increase in research in this field (Greep et al. 1976). A variety of improved methods is needed, since the diversity of the world's culture and peoples, and the

changing needs of men and women during the course of their reproductive lives, guarantee that a single, ideal contraceptive method will never be found. Contraception for the male merits high research priority, along with expanded study of methods aimed at the female. Possibilities include biodegradeable systems for the delivery of injectable hormonal contraception, immunological approaches, and reversible sterilization procedures. Choice among research topics should consider both the effectiveness of such potential systems and their prospects for scientific discovery.

Promising technologies are already in the development stage and promising leads have come from past research, but additional expertise and funding are needed to exploit these possibilities. We recommend that the United States propose international support for a priority international program of biomedically oriented contraceptive research. Many of the basic studies could be conducted in this country, but adaptive work needs to be conducted in local settings in both the United States and developing countries, as does study of the sociocultural factors affecting the use of contraceptives. Support should also be provided for local manufacture, assembly, distribution, and marketing of new contraceptive devices as they are developed.

Although national fertility patterns are controlled by the complex interplay of a number of social and economic forces, better contraceptive procedures would certainly influence family size and spacing, ultimately having a major impact on the rate of world population growth.

Urbanization and Industrialization

Exciting possibilities exist for applied research in the industrial, urban, transportation, and communication sectors. For example, a concerted international effort could be made to apply a systems approach to building or rebuilding urban communities, with special attention to the needs of the poorest inhabitants. Integrated adjustments in housing, transport, communications, industrial siting, and land use could improve living conditions and balance the relationship between urban and rural development.

Achieving these purposes in developing countries largely depends on the growth of both urban and rural industries. National capabilities for fitting industrial technologies to local conditions are key factors in establishing effective overall development patterns, as is a better understanding of the

industrialization process generally. It should be recognized that U.S. initiatives in the industrialization field are constrained by the fact that most U.S. industrial technology is in the private sector, which limits the extent of direct government influence on its transfer. Policies and institutional capabilities of both the United States and developing countries do, however, influence the incentives and opportunities for technology transfer and adaptation by the private sector.

9. Improving Urban Settlements

By the year 2000, about 40 percent of the developing world's population is likely to be living in urban places (variously defined). Improved technical skills in building and managing urban settlements could help avert the negative impacts of haphazard urbanization that affect both cities and rural areas.

Perhaps the greatest potential for building better cities lies in programs for integrated community-building, from self-help site-and-services projects to massive planned urban development. Many programs undertaken to date have been too costly, have ignored the poor, or have created communities that people find unsuited to their needs. Yet they demonstrate the feasibility of building whole communities through urban development corporations that attempt to lay out workable physical plans and employment opportunities consistent with economic and social goals.

We recommend that the United States propose an international undertaking through the new U.N. Habitat Center in Nairobi to help developing countries organize new metropolitan growth and redevelop existing slums and blighted areas. With adequate international support, programs already underway or being planned in several countries might provide important lessons for improving on the concepts and methods tried to date. We also propose that the United States allocate funds for a series of grants in developing countries for projects in smaller cities (which are potential counter-attractions to the metropolis) to demonstrate new applications of science and technology in solar energy, waste management, water recycling, desalination, innovative public transport, advances in telecommunications, and the like.

The United States might also offer to contribute to an international fund, perhaps managed by the World Bank, to provide loans for city-building activities, emphasizing integrated development of whole communities and covering a wide range of techniques. Control of urban land use is crucial. In market economies, where

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land can be bought by urban development agencies at prices that do not already reflect development prospects, the substantial increases in value that are subsequently realized can be captured in the lease of properties to industry and commerce. In such cases, international loans could be secured by rising land values and city-building agencies could use part of the returns for financing community facilities.

The United States has had some disappointing experiences in its own community-building efforts and could learn as much as any country from the experiences of others. However, this country does have useful system design capabilities, technological components, and skills that could be of great help in cooperative undertakings with other countries. To meet immediate training needs and to strengthen its own resources for community-building, we recommend that the United States (1) encourage development of domestic institutions that can conduct research and provide courses relevant to developing countries, and (2) support long-term relationships between urban agencies in the United States and developing countries.

10. Planning Transportation Systems

Transport services absorb a substantial portion of the capital budgets of all countries. In developing economies, the proportion is often as high as 25 to 35 percent of total public investments. And, since each method of transport is likely to be built and operated independently of the others, bottlenecks, redundancies, and inefficiencies often result.

No U.S. agency is concerned, on an adequate scale, with transportation as a whole in relation to development. Some university centers are moving in that direction, however, and the U.S. Department of Transportation is positioning itself to exploit the relationships between transport and considerations of land use, energy, productivity, employment, and the quality of life.

We recommend that the United States offer broad support for a number of international activities that would improve transportation infrastructure in developing countries and at the same time produce insights into U.S. transport problems. A key to progress in this field could be the establishment of a research and development network, sponsored by the World Bank or other concerned international agency. Research centers within such a network would focus on improving systems for transport planning as well as on innovative, resource-conserving transport solutions for national needs. The possibilities of substituting

modern telecommunications for some transportation functions (transmittal of information, delivery of mail, etc.) also need to be investigated. Training and joint experimental work should be stressed in order to build the capabilities of developing countries for transport planning and design work.

Analysis and dissemination of information and worldwide experience should be an important component of this network. Particularly emphasis should be put on low-cost practices (e.g., auto user charges, staggered work hours, all-bus or bicycle lanes and streets, and relocation of rail and truck terminals) designed to bring about a workable balance between public transit and the automobile in the world's cities and between transportation supply and the traffic implications of urban land use.

If the United States is to address the problem of transportation and development more effectively, U.S. institutions such as the Department of Transportation's Transportation System Center (Cambridge, Mass.) will need to be strengthened and aided in developing reciprocal relations with other countries. AID might provide funds for university centers willing to study the relationship between transportation and development economics and to create curricula relevant to the training of students from developing countries.

11. Building Capabilities for Creating and Using Industrial Technology

In all nations, the ability to absorb, devise, and use technology has an especially important influence on the growth of industrial output. However, very little of the world's industrial research and development now occurs in developing countries. While there is no assurance of success, there is little doubt that their prospects for industrialization will be enhanced if developing nations evolve indigenous capabilities in research and development.

Over the past 30 years, many institutions have been established in developing nations for creating, adapting, and disseminating industrial technology, but few have been effective. The United States is relatively well supplied with people whose skills and experience could help strengthen these institutions.

We propose that the United States offer support for developing countries interested in strengthening their capabilities through three types of institutions: (1) industrial research organizations that help the private and public sectors identify, acquire, develop, and apply suitable technology; (2) centers that specialize in research and development, extension, and informal

virtually unanimous interest in the subject. Consequently, we recommend that the United States indicate its intent to lend major new support for public and private research and development activities related to energy problems in developing countries. Major expansion in this direction could be made with only a small portion of the funds the United States will be spending on its own energy research and development, and these activities are likely to produce benefits for the United States as well as for others.

Among the actions recommended in addition to advanced education and training are that the United States:

-- Encourage government-sponsored research and development in the United States to be more responsive to opportunities to work on problems of interest to developing countries, especially on technologies for using renewable energy sources.
-- Develop a program to enable sites in the United States and developing countries with similar climate or geologic conditions or common interests in certain technologies to engage in cooperative research and development of small-scale technologies based on renewable energy resources.
-- Support joint teams of specialists from the United States and developing countries in cooperative study of such energy-intensive activities as transportation, industrial processing, agriculture, and housing. The work should have two objectives: conservation through energy-efficient designs and replacement of costly imports with indigenous energy sources.
-- Establish a specialized advisory service to help strengthen developing countries' capabilities to plan for energy development and promote efficient use of energy. The service could draw from U.S. government, business, and university resources in a broad range of relevant disciplines.
-- Sponsor demonstration projects in developing countries jointly with local institutions to test the local viability of innovative technology designed to reduce energy requirements in agricultural and industrial production and in supply of public services.
-- Support a network of regional research and development institutions in developing countries to concentrate on the energy problems of their regions. To the extent possible, these should be existing institutions whose work could be broadened for this purpose. The United States could also sponsor a continuing series of regional seminars, workshops, and symposia for periodic exchange of information and ideas. Such activities could be valuable learning experiences for U.S. as well as developing country personnel.
-- Create internships, in cooperation with private industry, so that individuals from developing countries can work directly in U.S. companies, especially those engaged in geophysical studies, exploratory drilling, and development of small gas and oil fields.
-- Strengthen personnel training programs in the energy field.
-- Invite developing countries with significant coal resources to collaborate with U.S. government laboratories on research and engineering on techniques for improving coal combustion and converting coal to liquids or gases suitable for use as fuels or chemical feedstocks.

Developing countries must continue to seek and exploit their own reserves of fossil fuels,[2] but the greatest long-term prospects for increased energy supplies lie in exploiting renewable resources. Especially important are decentralized technologies which may provide energy to rural areas without the need to develop far-flung electric power grids such as those on which the United States has come to depend. Much of this work in the United States is in the private sector. Some promising technologies have been developed and others are on the drawing boards based on solar energy used directly (e.g., heating, distillation, photovoltaic conversion) or indirectly (e.g., wind, biomass, hydropower).

Energy costs are high in most developing countries, and highest in their rural areas. Thus widespread use of solar energy is likely to become economically attractive sooner in those countries than in developed countries which are already committed to existing central generation and distribution of electricity. Expansion of markets in developing countries could in turn accelerate price reductions of technologies potentially applicable in the United States. U.S. consumers, as well as companies manufacturing solar-related products, would be direct beneficiaries of such a trend.

14. Remote Sensing and Other Applications of Satellite Technology

U.S. space-age technology is proving ever more useful for tasks associated with development here and abroad. For example, the remote sensing resource satellites--ERTS, and now LANDSAT--are already mapping

large parts of the globe and their products are readily available. Coupled with limited ground surveys, this technology can be used for locating and assessing natural resources, assessing weather and crop patterns, and mapping the topography of inaccessible areas.

Although the technology embodied in these systems is extremely complex, useful information can be extracted even with quite simple equipment and interpretation capabilities. The information generated can help developing countries avert costly mistakes, such as overuse or abuse of soil, water, and ground cover; misplacement of roads; and faulty irrigation planning. Indigenous natural resources may be discovered, and resettlement programs in frontier areas may be facilitated. We recommend that the United States offer greatly enhanced use of LANDSAT for these and other development purposes, building on the experimental programs in developing countries already undertaken by the National Aeronautics and Space Administration (NASA) and AID.

Communications satellites and broadcast satellites are also proving their worth. The former might be used to help establish links among research and development institutes and the latter to contribute to education and rural programming.

The marginal costs of U.S. cooperation in the use of satellite technology in developing countries would ordinarily be relatively small on both sides, since the costs of developing the requisite hardware and software have already been largely committed by the United States for its own purposes. Specifically, we recommend that the United States declare its intent (1) to continue the development of remote sensing technology and to support international collaboration in establishing and operating an efficient network of receiving stations and ancillary services; (2) to enlarge access to U.S. remote sensing imagery and related data; and (3) to expand training and research and development programs in developing countries, as requested, to build capabilities for gathering and interpreting satellite-generated data.

We also recommend further experimentation with educational and informational uses of broadcasting satellites in interested developing countries as well as feasibility studies for making greater use of communications satellites for international information exchange. Although some countries have expressed concern that satellites are potentially intrusive, the technology is available to minimize this problem, and we believe that the interest already shown by developing countries indicates that an offer of the kind suggested would be welcomed.

15. Sustained, Multiple Use of Forest Resources

The United States supports about half of the world's forest research, and it has considerable experience in the development of fast-growing species, optimization of seeding and harvesting patterns, utilization of secondary species, and extraction of chemical substrates. It is in the early stages of experimenting with "energy plantations." Remote sensing via satellites offers new opportunities for identifying forest resources, assessing the impact of development activities, and detecting the onset and early spread of forest diseases.

Some of this research has related to developed countries, and much more is known about temperate zone forestry than about the special problems of tropical forests. However, we believe that the United States could make a major contribution to international development by supporting a greatly enlarged research effort in sustained, multiple use of forest resources in developing countries. Central to this effort would be the establishment or designation of two or three first-class regional institutes in developing countries, patterned after the international agricultural research institutes and oriented toward different ecological zones. These institutes could support research in forest ecology, development and testing of improved varieties, reforestation, determination of sustainable yields, resistance to insects and disease, and innovative use of forest products. We also suggest that a strengthened array of research and experiment stations in the developing countries be integrally related to the regional institutes to keep the regional staff attuned to problems in the field and to help train the specialists that are sorely needed. In addition, we recommend that the United States support the newly created International Council for Research on Agroforestry, which is designed to fulfill such functions as information exchange, identification of research gaps, and encouragement of research funding.

This scientific thrust must be accompanied by improved forest planning and policy in developing countries. Forest exploitation is increasing rapidly in many of these countries in response to pressures for export earnings, building materials, fuel, and forage, as well as to make way for habitation and farming. Such exploitation seldom reflects optimal use either in the near term or over the lengthy time cycle needed for truly sustainable forest management. Unsound harvesting practices often degrade the productivity of the land, destroy wildlife habitats, and invite erosion which destroys adjacent farmland and aggravates

problems of sedimentation and flooding. Insects, disease, and fire continue to take a heavy toll. Developing countries have shown an interest in U.S. and FAO expertise on forest planning and policy, and the United States should be prepared to respond to requests for assistance.

16. Research on the Marine Environment

Partly as a result of agreements reached at the U.N. Conference on the Law of the Sea, coastal countries will acquire new rights to, and responsibilities toward, living resources and protection of the marine environment within 200 miles of their shores. But the effective exercise of these rights and responsibilities will require more scientific understanding, cooperation, and mutual sharing of information than is now available.

Not enough is known, for example, about the earth's estuarine and coastal resources, especially their management to ensure sustained, multiple use at high levels of productivity. Nor is the background information yet available to understand the rather complex array of water movements from within estuaries to the continental shelves and along the shelves where the ocean meets more shallow water. Such information should add considerably to our understanding of coastal fisheries, distribution of urban and industrial wastes, and the extent to which offshore mining and sewage disposal, marine transport operations, and recreational activities may affect and be affected by the use of biological marine resources in adjacent areas. Planners would then be better able to assess tradeoffs among potential uses of marine resources.

Recent large-scale international oceanographic programs--the International Decade of Ocean Exploration (IDOE) and the Global Atmospheric Research Program--have advanced the state of knowledge concerning coupling between the atmosphere and the oceans. Testable hypotheses and theories now exist, in particular on the connections between ocean and coastal shelf circulation in a number of regions and how these events may affect fluctuations in the productivity of major fisheries. Within the U.S. oceanographic community, there is considerable interest in studying these and related phenomena, but a mutually agreed basis for sharing of information is needed.

Marine research is necessarily international and cooperative, since scientists need access to the waters of other nations to obtain data and samples. Many developing countries are only now beginning to recognize the need for personnel trained in marine

science to provide accurate evaluation, both short and long term, of national resources. Even where trained personnel exist, marine research facilities are often inadequate, even for studies in coastal areas. It is, therefore, in the interest of both developing and developed countries to mount a systematic and adequately financed effort to assist in creating strong marine science institutions in coastal developing countries.

We recommend that the United States declare its readiness to support, through the U.S. Sea Grant Program, long-term training for developing country scientists, extension services to developing country institutions, and cooperative research on the marine environment, especially in estuarine and coastal areas. Such programs would be greatly strengthened by a U.S. offer to help finance, where requested, acquisition of modern facilities and provision of temporary personnel to help build up regional institutes of marine resources.

General Initiatives

The need for improvement of several general capabilities in both the United States and developing countries becomes apparent when we compare the reports of our various panels. U.S. proposals at the 1979 Conference should speak to these general concerns.

17. Strengthening Scientific and Technological Policymaking

We give particularly high priority to assistance in strengthening assessment and planning capabilities. Countries need government planners and decision makers who know how to bring science and technology to bear on national policy and, conversely, how government policy affects national capabilities in science and technology. The impact of newly introduced technology is not uniformly positive. For example, centralized power and telecommunications systems may make countries excessively dependent on grids and relay stations that are expensive and difficult to maintain and incur unnecessary power losses in long-distance transmission. New agricultural practices brought by the Green Revolution, although impressively successful in raising food production, left some small farmers worse off than before because adjustments were not made in complementary agricultural policies. Such impacts on the complex patterns of development cannot be anticipated adequately by casual assessment processes.

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Effective policymaking requires the combined talents of planners and natural and social scientists in an institutional setting that permits systematic analysis.

We suggest that the United States might usefully offer (1) to continue and, if demand warrants, expand short-term exchanges of senior scientists, engineers, and managers to discuss with colleagues in developing countries ways to strengthen mechanisms for bringing local scientific and technical expertise to bear on development policies; (2) to support training of U.S. experts who could consult with developing country planners on ways to institutionalize science and technology in national policymaking; and (3) to develop, in collaboration with developing country analysts, a program of research exploring ways to improve linkages among research and development institutes and between them and individual enterprises.

Another possibility might be to consider whether the United States could help universities or private sector institutions in developing countries to complement policy analysis by government agencies. Much constructive review of U.S. policy is done outside the government; organizations like The Brookings Institution, the American Enterprise Institute for Public Policy Research, Resources for the Future, Inc., and others offer useful counterweights to planning and analysis within the U.S. government. The United States might explore potential contributions to encouraging the development of such institutions in developing countries.

An important function of government policymaking and planning is to promote the health of the nation's scientific and technical capabilities. Large dividends can be expected from strengthening working relationships among organizations concerned with science and technology. Still larger returns are possible from linkages between these organizations and users of technology in the public and private sectors. National research and development laboratories in developing countries have often been ineffective in relating their activities directly to the nation's production needs. One reason for this is that many developing countries need skilled managers of science and technology even more than they need highly trained scientists and engineers.

Nevertheless, the long-term progress of technology development in developing countries depends on a gradual strengthening of science education and research in those countries, and the United States should make clear that it supports this goal. Strengthening the institutions in which scientists work would facilitiate channeling scientific resources in support of efforts to overcome specific local barriers to technological

advance. It would also make it possible for these scientists to contribute to the world stream of scientific knowledge without, as so often happens now, having to move to developed countries to find the facilities they need.

18. Information Sharing

Systems for effectively gathering, organizing, disseminating, and using data and information are basic tools for conducting research and managing modern economies. Despite evidence that developing countries want both to manage their own information resources more effectively and to achieve better access to the international "knowledge sector," relatively few resources have been devoted to such activities.

Later chapters in this report suggest that the United States help developing countries build specialized systems to provide data on energy supply, land-use planning, and many other subjects, and that it support specialized information centers or services for weather and crops, germ plasm collection, and water treatment, among others. The need to link international data and information with national development programs--through data banks, repository libraries, referral and extension services, clearinghouses, and use of appropriate forms of systems analysis--is cited repeatedly.

Information supply and management is becoming a more specialized field. We believe that the United States, with its strong public and private capabilities, can help developing countries in three ways: (1) by helping to strengthen national capabilities in information management, (2) by developing programs to train information specialists and "consumers," and (3) by promoting greater access to U.S. information resources. Considerable opportunity exists for the private sector to become involved in these programs. The important thing is to tie information services as directly as possible to specific user needs.

In arriving at a national information policy, developing countries are wise to give priority to strengthening information systems in subject areas of greatest importance to them. Nevertheless, certain general services are important to the efficient use of any information resources. These include national bibliographic control, document reproduction and delivery, translation facilities, information processing technologies, training of specialists, and programs to teach "consumers" how to use modern information services. It would be appropriate,

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therefore, for the United States to offer to assist developing countries, through its technical assistance programs or through appropriate international or regional programs, in creating or strengthening general national information management capabilities.

In addition, the United States might support development of special training programs at some of the many U.S. institutions offering education in information management.[3] These programs should encompass training for users as well as specialists from developing countries. Users could be exposed to sources of information--including standards, patents, manufacturers' catalogues, technical reports and journals, and searchable data bases--and to techniques for locating and acquiring public and proprietary technologies.

U.S. public and private information resources range from comprehensive mission-oriented and discipline-based systems to very specialized services.[4] Collectively, they provide bibliographic information and abstracts of published literature; information about research in progress; numeric data and analysis; information on patents and products, including technology available for licensing; and document delivery services. Some resources are maintained by federal and state governments or nonprofit institutions; others are available commercially.

As a first step in making these systems and services more accessible to developing countries, the United States could support international or regional programs to improve document availability and delivery. Bibliographic references and alerting services are of limited use if the underlying documents cannot be obtained. The United States could also survey U.S.-based systems, services, and programs in key problem areas to be considered by the 1979 Conference. Such an overview, in combination with the United Nations' own continuing survey, would help clarify the gaps in present information systems and identify ways of filling them.

At last count, at least 100 specialized information systems, services, and programs were sponsored by U.N. regional commissions and specialized agencies.[5] International bodies often suggest creating new comprehensive systems along the lines of the International Atomic Energy Agency's International Nuclear Information Service (INIS) and the Agricultural Research Information Service (AGRIS), sponsored by FAO. Such comprehensive systems may or may not be justified on the basis of costs, user needs, and overlap with existing services.

An alternative approach is to provide U.S. support for strengthening information systems tied to

international research and development networks that themselves generate and use specialized data. These delimited information systems tend to have a certain built-in selectivity and quality control, relatively low costs, and strong user demand for their products. The United States could also support U.S.-based technical inquiry services in selected fields. Successful examples that use networks of volunteers, thus minimizing costs, already exist in the areas of nutrition, fertilizers, and small-scale technology.

19. Education in the United States

Developing country leaders have often said that the U.S. role in education and training has been this country's largest contribution to development. Hundreds of thousands of students from developing countries have studied in the United States, representing a resource of incalculable value to their home countries. In 1974-75, for example, at least 125,000 undergraduate and graduate students from developing countries were studying in U.S. universities, and their numbers are growing rapidly. The great majority of these students come to this country privately or on scholarships from their own governments.

We believe that U.S. institutions can do more to make the education of these students relevant to the needs of their nations, particularly in such fields as engineering, agriculture, and medicine. For example, scholarships, fellowships, and research grants can be used more effectively as incentives to draw students into shortage areas and away from fields that are popular or appropriate to U.S. needs but not necessarily of high priority in developing countries. An educational approach is needed that emphasizes flexible application of modern science to the great variety of forms in which development problems actually arise. This is not easily done, since research equipment and the interests of research preceptors are partly determined by current research styles in the Western world, which rely heavily on sophisticated methodology and elaborate facilities that may not be available when students return home. Such institutions as the Institute for International Education (IIE) or the newly formed Council for International Cooperation on Higher Education might become effective agents in this effort to reorient some aspects of higher education at American institutions.

The United States could support development of special courses or special units of general courses oriented to developing countries in order to encourage

foreign students to relate their training to problems and conditions in their own countries. A good number of universities, departments, or regions have concentrations of students from developing countries which would justify a special effort in this direction. As many as 25 percent of the graduate students in some American engineering schools come from foreign countries (NRC 1976). In 1974-75, 67 colleges and universities had more than 500 foreign students on their campuses, of whom 85 percent overall were from developing countries (IIE 1975). The foreign student population in cities like Boston, New York, Washington, Los Angeles, and many smaller centers could easily support courses offered jointly by several universities. Such courses are also good training grounds for American students interested in international development problems.

The United States could also provide incentive programs to encourage graduate students from developing countries to do their theses on problems of importance in their own countries. Ideally, more graduate research will take place in students' home countries. A number of U.S. institutions have begun to experiment with a variety of arrangements for sharing teaching, research, and accreditation responsibilities with national and international institutions in developing countries. U.S. government funding could play a catalytic role by helping to defray special costs resulting from the international character of such research activities.

20. Short-term, Nondegree Training

As valuable as U.S. formal education has been and is, we believe that it needs to be extensively supplemented by less orthodox types of educational activities.

Short training courses of a few weeks or a few months can be particularly effective both in teaching highly specialized techniques and in introducing planners and policymakers to the potentials of scientific and technical advances. Under U.S. bilateral aid programs, individual training grants have gone to over 180,000 persons for study in the United States and other countries. This aspect of development assistance should be broadened to include a heavier component of scientific and technical training, with as much of the training as possible done in developing countries. Professional associations and engineering societies could be used more to help organize appropriate training, workshops, and symposia and to maintain professional contact with U.S.-trained

scientists and engineers who have returned to their home countries.

At another level, training within developing countries in vocational subjects and technical support skills needs to be greatly expanded. Typically, developing countries are still short of people with crucial supporting skills such as equipment repair and maintenance, bookkeeping, welding, data processing, materials inventorying, paramedical techniques, and the like. The problem is not only to strengthen specific technical training but also to spread technical awareness more widely through the population. Younger generations in developing countries are increasingly literate, and aptitudes for scientific and technical work need to be encouraged in early education. The Peace Corps is a useful vehicle for supporting local efforts in this direction.

The United States has in the past provided personnel and funds for building technical training schools in developing countries and will continue to do so. In the future, greater use might be made of the capabilities of U.S. community colleges in this effort. Beyond the educational establishments, however, transnational corporations operating abroad are increasingly perceived as important sources for technical and managerial training. If U.S. experience is applicable, some of the individuals trained through such programs will eventually start new entrepreneurial enterprises, thus building long-range capability for business expansion in developing countries besides providing the skills and local service industries necessary to attract investment.

A great deal of both professional and technical training is already being done by private companies either in the United States or through their affiliates in developing countries. It is a measure of the decentralized, pluralistic character of U.S. society that there does not appear to be any comprehensive inventory of this training, though it is known to be large. We suggest that the United States, as part of its preparations for the 1979 Conference, attempt to survey development-related training presently carried on by U.S. private industry, with a view to considering its present potential and how it might appropriately be enlarged or improved. We believe that U.S. companies would generally be receptive to feasible proposals for strengthening their training activities.

21. Continuing University Interchange

Hundreds of our scientific and technical institutions maintain exchange relationships with developing countries which contribute to building functional capabilities in those countries and to maintaining professional skills and knowledge; many would like to strengthen these relationships if more support were available.

One device for supporting long-term university involvement in research collaboration and institution-building in developing countries is Title XII of the Foreign Assistance Act of 1977, presently restricted to the food and nutrition fields. This legislation has evoked very favorable response from U.S. universities, but implementation has been slow. We recommend that programming under Title XII be speeded up; in light of further experience, consideration might be given to extending it to other fields.

The United States also needs to develop mechanisms for continuing involvement with developing country institutions once the development aid period has passed. Scientists and technicians in developing countries seek continuing contact. As their institutions gain strength, they become increasingly viable partners for mutually beneficial research programs and long-term, self-sustaining institutional relationships. The lack of mechanisms to provide even marginal assistance at just this crucial point risks losing some of the greatest potential returns on the U.S. aid investment. We recommend that the United States support a modest program to enable U.S. universities and other research institutions to cover some of the special overhead costs of international collaboration in research and development and to continue to exchange scholars, subscribe to each other's journals, mount joint workshops, and the like, in order to cement continuing, productive relationships.

22. Incentives for Development-Related Research in the United States

The U.S. research and development community commands powerful capabilities that can support development if the policy environment is supportive. In the case of government-sponsored research, facilitative legislation may be needed. In the health field, for example, legislative restrictions sometimes limit the types of involvement federal agencies can have; it has been suggested that the charters of the Department of Health, Education, and Welfare (HEW) and, particularly, the Public Health Service, be revised to include special authority to engage in health activities that have global dimensions. Section 1458 of the Food and Agriculture Act of 1977 is an example of the kind of action that is needed. This section explicitly authorizes the Department of Agriculture to "expand [its] coordination...with institutions and other persons throughout the world" by exchanging research materials and conducting joint research and extension. We believe that legislation of this sort is needed more widely at federal and state levels.

A further need is to increase incentives for work on development-related problems within the U.S. scientific and technical communities. Adjustments of topical priorities in government and university allocations of research, fellowship, and scholarship funds may be the most important line of action the United States could take in order to raise the status of research in development fields.

International prizes and honors for distinguished achievement in science and technology for development might also be incentives. Such awards, toward which the United States might offer to contribute, could be patterned after those given by the Magsaysay Foundation in the Philippines, where an international committee awards five $10,000 prizes to individuals resident in Asia who have performed outstanding service to their community.

MODES OF INTERNATIONAL COLLABORATION

A question faced throughout this report is how best to reconcile several organizational objectives: strengthening capabilities in developing countries for finding and applying suitable technology; enabling them to make fuller use of worldwide scientific and technical capabilities; invigorating worldwide processes for solving major development problems and establishing the critical mass of technical resources needed to overcome these problems; keeping the costs of all this within feasible bounds; and attracting high quality technical participation from developed countries on a continuing basis. To meet these difficult requirements, our panels have sought modes of strengthening continuing, systematic collaboration among organizations in all countries that are addressing a common problem. Such collaborative systems are frequently referred to in the development literature and in this report as research or research and development or problem-solving "networks." Experience has shown that research networks can be effective under suitable circumstances, for example,

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when they are focused on quite explicit problems, with minimal political and bureaucratic interference and strong demand for the product.

Ideally, collaboration on research and development, technology testing, policy analysis, or other problem-solving work can produce a net result greater than the sum of its individual parts. Participants can share specialized research equipment, skills, and findings. Experimental sites located in different environments speed results, and, when common research protocols and evaluation processes are used, offer possibilities for comparative evaluations. Costs can be cut by means of divisions of labor, pooling data, and sharing such services as the collection of information, specialized training, and storage of research materials, including software designs. Participants from developing countries can gain training, advice, and access to worldwide scientific and technical capabilities beyond anything they could mobilize on their own, even with large-scale assistance.

These advantages must be balanced, however, against the possible disadvantages of maintaining a central organization for the collaborative system. Costs include increased overhead expenditures, use of scarce professional time to oversee coordinated activities, and some loss of individual flexibility by the collaborators. Where the central organization conducts part of the problem-solving work, there may well be added costs and difficulties in interacting effectively over great distances with those who would use the results.

Scientists have long pursued opportunities for ad hoc collaboration or exchanges of information with foreign colleagues on problems of common interest. International work on development problems over the past decade or so, particularly in agriculture but also in other fields, has brought out the practical values mentioned earlier of more systematic, continuing collaboration in a format of voluntary participation and mutual determination of common activities among all participants. There are many possible variations in organization, ranging from programming committees to quite elaborate administrative structures. Each has advantages and disadvantages in specific circumstances. Regional intergovernmental institutions, for example, enable developing countries to pool their efforts on a scale large enough to work effectively on tough problems, but many such institutions have been unable to sustain adequate financing, linkages with national operating organizations, and freedom from intergovernmental politics. The private autonomous international research institutes, which are nerve centers for worldwide networks that collaborate on

improving major crops and farming systems, are expensive and difficult to replicate, but when proper circumstances exist, including assured financial support, they have been highly successful.[6] Programming committees that represent research organizations and/or the organizations that finance them are the simplest type of institutional collaboration. Although such committees may get a modest budget for staff or "start-up" activities, the participating organizations do most of the work and may even provide limited common services. These kinds of international networks, operating independently of the U.N. system but maintaining cooperative linkages with it, can be a useful complement to the U.N. agency programs.

This report recommends many new initiatives to increase international research and development, often with preliminary judgments as to the appropriate type of organization. If increased collaboration in a particular field is accepted as a priority initiative, however, further exploration will be needed of specific institutional mechanisms that seem to fit the situation best.

CONCLUSION

The United States appears to have an important new opportunity to work with other nations in applying science and technology to development problems, to the benefit of all participants. This new opportunity arises from the juxtaposition of several factors:

-- The U.S. research and development community, which commands powerful scientific and technological capabilities relevant to development, is showing greater interest in international collaboration.
-- The United States is reexamining its development assistance programs, opening new prospects for using science and technology more effectively.
-- Properly managed, international collaboration and exchange can enhance U.S. efforts to sustain the internal dynamism and innovative drive of its economy, even in the face of serious U.S. employment problems, growing resource scarcities, and environmental deterioration.
-- To meet their requirements for technology, developing countries appear to be seeking a two-part strategy of (1) building their own capabilities for research and development, and (2) expanding collaboration among themselves and with the developed countries.

We believe that U.S. initiatives of the types described throughout this report can help to realize this opportunity and that the U.S. research and development community stands ready to respond.

Appendix II. "Principal Conclusions" and "Observations and Suggestions," from Public Policy and Technology Transfer: Viewpoints of U.S. Business, Vol. 1.

Source: Public Policy and Technology Transfer. Viewpoints of U.S. Business. Vol. 1. Overview and Policy Considerations. By Fund for Multinational Management Education, Council of the Americas, United States Council of the International Chamber of Commerce, and the George Washington University. Washington, Fund for Multinational Management Education, 1978, pp. 9-20.

Public Policy and Technology Transfer

Viewpoints of U.S. Business

volume 1 **Overview and Policy Considerations**

Fund for Multinational Management Education
Council of the Americas
United States Council of the International Chamber of Commerce
The George Washington University

The policy suggestions, analyses, and conclusions put forward in this volume do not necessarily represent the views of any single corporation or corporate participant in the project, or of the four sponsoring organizations.

This study was funded by the United States Department of State under contract number 1722-720261.
The views and conclusions expressed herein are not those of the United States Department of State.

Publication Date: March 1978
Library of Congress Card Catalog Number: 78-54600
ISBN: 0-915814-20-X

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OBSERVATIONS AND SUGGESTIONS

Private Transfer and Incentives

Most of the technology transferred by U.S. business to developing countries is transmitted through person-to-person contact, primarily in the form of training and manpower development. This is generally true with patented technology as well as with unpatented know-how such as managerial, marketing, and financial skills.

U.S. firms transfer technology whenever there is an opportunity to carry out a commercially viable operation. Companies will consider possible transfer in light of their own particular short- and long-term business interests, organizational formats, transfer strategies, and assessments of the risks involved.

There are significant policy-related differences among the various business sectors in their approach to technology transfer. In particular, manufacturing, extractive, agribusiness, and service industries display distinctly different characteristics. These differences have an impact on the costs, returns, effects, and tradeoffs of transfer for both the home

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and host countries. As a result, analysis of the effects of technology transfer is impossible on an aggregate basis. No overall policy will fit the multiple situations that exist among the sectors.

Objectives of companies differ. Some may enter a country to develop and service a local market demand, others may establish a facility as part of a worldwide production system, and still others may produce for export back to the United States. In each of these situations, the company will react differently to the same local legislation. Export promotion policies, for example, may be a disincentive for the company producing for the local market. Stiff requirements for local content may in some cases make worldwide distribution or sales back to the U.S. difficult because of international safety and quality standards.

Organizational formats chosen by companies vary as well. Some companies require full equity ownership in order to protect valuable proprietary know-how. Others are willing to operate in joint ventures as long as they can protect their proprietary know-how. Some manufacturing companies, for example, will license their technology where the local capabilities exist to operate a company effectively. Many agribusiness and service companies have as a primary concern the ability to integrate the operations of the local company into the multinational organization. Although both petroleum and mining companies still favor equity ventures, the oil companies enter into a variety of business relationships in a host country, some of which involve licensing of technology.

It is important to distinguish between the sale and licensing of technology. Sale denotes transfer of ownership of the technology to the recipient while licensing merely provides the licensee with a right to the utilization of the technology for limited duration and application. Most technology owners are not willing to sell their technology for unlimited use unless the payment is sufficient to compensate the owner for the resulting loss of potential markets and the potential diffusion of the technology. Thus compensation must be greater for a sale than for rental of a given technology. Because many developing country governments consider a license agreement to be an installment purchase of the technology, many suppliers will charge as high a price as if the technology were being sold; others will not transfer the technology pursuant to such an arrangement.

The corporate participants in this project believe certain phenomena must be fully recognized in any discussion of technology transfers to developing countries. Among these are

- Technology is only one of the many factors that aid in the process of development. The placing of excessive demands on technology will sidetrack planners and development technicians from other equally important considerations.
- The existence of alternative sources of technology has increased the bargaining power of the developing country recipients.

Role of Developing Countries

1 To encourage increased technology transfers by foreign corporations, developing country governments should permit adequate compensation to be freely negotiated between the contracting parties. The amount of the payment should be a function of the value and benefit of the technology to the recipient, and of the risks and costs to the supplier for developing and transferring the technology. The greater the risks, the higher the unit cost.

Role of the United States Government

The effective involvement of the United States in the economic progress of the developing countries requires an affirmative attitude toward the export of technology from the United States.

However, given the myriad of mechanisms through which technology is transferred, the variety of approaches and concerns of the various industries, the differences among

the developing countries, and the complexity of the United States Government strategy with regard to international economic problems, no single policy can effectively address all of these basic concerns. Even a general policy designed to promote technology flows will require exceptions based on the differences among companies, industries, recipient countries and recipient companies.

Moreover, there is concern within the U.S. business community that the attitude of the government toward technology transfers is shifting from a positive to a negative stance. This conclusion stems from the perceived lack of coordination and agreement among the various governmental departments on the importance of technology transfers to the U.S. economy.

2 In international fora and bilateral discussions the U.S. should affirm the merit of the existing transfer system and its relevance to development.

3 The United States Government should support and encourage analysis of currently available information that might shed light on the costs and benefits of existing and proposed legislation, rules and regulations for both the supplier of technology and the recipient country.

4 The United States Government should resist pressures for additional regulation of the outflows of technology from the U.S. to both developed and developing nations, except as they might affect national security. Taxation and restrictive controls on the movement of technology will contribute to an undermining of the innovative requirements of world trade. All concerned federal departments and agencies should assume a uniform and positive stance towards technology transfer.

Role of U.S. Business

5 U.S. companies should more effectively measure and explain the costs and benefits of their technologies in relation to development efforts.

Capability to Absorb Technology

Fourth World countries need more local managerial, administrative and technical know-how, which will enable them to select, utilize, adapt and develop technology.

Foreign corporations can and do play a significant role in importing and keeping in the host country the skills necessary for the utilization and adaptation of technologies. The descriptive cases in Volume II indicate the kinds of manpower development undertaken by the companies in host countries and the amounts of time and effort expended in these activities. Because extensive training networks are already in place, a large number of the participating companies indicated a willingness to assist in various ways in the achievement of national goals in manpower development.

The suggestions which follow address certain of the factors that might be altered to increase the capability of Fourth World countries to absorb technology.

Role of Developing Countries

6 Developing country governments should establish training centers with the objective of improving skills not only in trades (which is being done) but also in systems areas such as maintenance, repair, quality control, and distribution. Many of the needed skills are nonproprietary, and foreign companies are already involved in such training in their own operations. Thus, informal assistance from foreign corporations operating in the country might be expected to take the following forms: availability of personnel from local staffs on a short-term basis, training materials, financial support for the centers, or contracting for training courses for their own personnel. Retired foreign corporate technical personnel might be engaged as teachers in such centers.

7 A major concern of developing countries is the need to assist local companies in locating, selecting, adapting,

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and diffusing technology, as well as the establishment of national product and process standards to improve productive efficiency and enhance export potential. Centers could be established by local governments to channel applied know-how to one or two priority industries which are the leading edge of the development process in the country, rather than attempting basic scientific research. They should provide direct assistance to local private and public firms. The involvement of local and foreign business experts should be encouraged at the early stages of program planning. Nonproprietary technical assistance to firms might be made available through a relevant industry association, in the form of documentation, retired executives, and/or technicians from the industries.

The centers might undertake tasks such as

- establishing criteria for the evaluation of technology by local government and/or private industry;
- developing national standards that meet international export requirements.

Role of the United States Government

Even though the encouragement of increased technology transfer rests principally on recipient country investment conditions, the United States Government has a role to play. This is especially true in the Fourth World where the creation of an adequate S&T and physical infrastructure is involved. While no major new programs are suggested, certain actions might be taken by the United States Government in the area of strengthening existing technical assistance programs.

8 U.S.-assisted educational programs in developing countries should be appropriate to the development level of the country. Instructional materials should reflect this same level of sophistication.

9 U.S. public and private scholarship programs for foreign students to study in the United States should be more specifically tailored to developing country needs. Among the subjects that should be stressed are management and administration, industrial engineering, and marketing. It is imperative that study programs impart skills that will prepare students for the job opportunities that exist in their countries. In addition, U.S. public and private resources should be made available to U.S. business schools to develop teaching materials and programs on management and business activities related to developing country needs.

10 The United States can effectively respond to the infrastructural needs of the developing countries by maintaining a leadership position in the development of innovative technologies. It is therefore suggested that the United States Government enact appropriate legislation and embrace policies and incentives that will encourage increased domestic R&D and other factors basic to the innovation process.

11 In the reevaluation of existing technical assistance programs, the United States should recognize the differences between Third and Fourth World nations and seek to ensure that programs are implemented that respond to the needs of the Third World countries as well as those of the Fourth World. This is especially important because of the leadership role of Third World nations in the technology debate.

Environment for Technology Transfer

In addition to the market and the availability of skilled manpower and facilities, technology transfer responds to the environment that has been created for it by the governments of both supplier and user countries.

A troublesome complication arises from conflicts between the legislation of the supplier nation and that of the receiving nation. Such conflicts reduce the flow of technology, or bring about terms less favorable to both the supplier and the user.

Role of Developing Countries

12 The confidentiality of technology must be guaranteed. and maintained for a reasonable period of time after termination of the agreement, depending on the technology and taking into consideration the residual rights of the licensor and licensee.

13 Governments should recognize that forced continual renegotiation of contracts may discourage the international flow of technology because it gives rise to a perception of instability.

14 The negotiation of international arbitration agreements can alleviate many fears concerning the settlement of investment disputes, including those involving technology transfers, between foreign investors and national governments. Efforts to negotiate such agreements should be increased. Governments having national regulations that prohibit neutral arbitration of disputes should consider elimination of such regulations.

15 The rights of suppliers and receivers of technology freely to exchange improvements in a basic technology are beneficial to both user and supplier and should be upheld by national governments.

16 Improvements to the technology which might be offered during the term of the license agreement should have the same term as the original agreement.

17 Requirements that the supplier of technology guarantee the quality of the final product without the necessary control of the application of the technology will result in increased costs to the user or refusal to supply technology.

18 Governmental requirements that the recipient export products resulting from the application of technology may decrease the flow of technology.

19 More developing countries should initiate more specific programs to inform suppliers of their development goals and of the technologies needed to achieve these goals, so that suppliers can be responsive to them.

20 To facilitate the ability of technology suppliers to transfer technology that supports host country development goals, governments should encourage better communication and coordination among their own agencies to avoid conflicting policies and regulations. Conflicting demands and goals of host country agencies, and the lack of continuity within the technical ranks in the government, often result in inordinate delays in approval of technology transfer agreements and may discourage transfers.

21 Developing countries should evaluate the impact of their regulations on technology transfers to determine whether these have impeded or encouraged such transfers.

Role of the United States Government

Differing viewpoints among United States Government agencies and departments appear to have created a shift away from attitudes that would encourage international transfers of technology. Much of this change can be related to concerns over the domestic impact of such transfers on employment and on the economy in general. Since active participation in international commerce is directly in the interests of the United States, steps should be taken to arrive at a well-coordinated overall positive posture. Specifically, certain changes in policy should be considered in the areas of taxation and export control.

A major problem for U.S. technology suppliers arises from a conflict between U.S. and most developing country tax legislation. For example, the United States requires its firms to allocate research and development (R&D) and other costs to foreign subsidiaries according to use, and will not permit their full deduction as a business expense for U.S. tax purposes (thus affording an advantage to European competitors). Many developing country gove nments, on the other hand, either do not permit such payments to the parent company by a subsidiary within that country, or do not

permit the subsidiary to deduct such payments for tax purposes.

United States Government programs that provide assistance to businesses engaging in international technology transfer projects are not always competitive with those offered by some other countries to their businesses. This puts U.S. business at a competitive disadvantage with other developed nation suppliers of technology and technical assistance in large projects which involve significant capital outlays or other investment risks. Many examples given relate to problems of obtaining potentially large contracts for turn-key and other such contracts within the OPEC countries.

The United States should consider taking the following actions:

22 Reconsider current Internal Revenue Service regulations that require allocation of R&D expenditures to all operating subsidiaries in light of their potential and real impact on the international transfer of technology.

23 Reconsider U.S. tax laws that negatively affect the employment abroad of U.S. citizens, specifically Section 911 of the U.S. Internal Revenue Code.

24 Negotiate bilateral tax treaties or agreements specifically aimed at eliminating double taxation for U.S. firms operating in developing countries.

25 Consider including in the U.S. Tax Code appropriate exemptions or incentives for U.S. firms which would encourage these firms to expand their activities in the developing countries.

26 Review the application of antitrust legislation in light of national interests in the international transfer of technology, especially concerning international licensing (including that of trade secrets and know-how), joint ventures, trade and investments.

27 Encourage the Overseas Private Investment Corporation to provide further protection against continual changes in contractual arrangements, against the gradual cessation of payments, and more generally against the risks involved in technology transfers.

28 Establish programs to train foreign service officers to deal with the issue of technology transfer.

29 Make efforts to increase cooperation between business and government, particularly in the process of policy formulation. Such greater interaction can aid in more effective policy review in areas of mutual interest. Other groups affected by such policy reviews should be included in this process.

30 Include representatives of the private sector as members, not just observers, of U.S. delegations to international conferences discussing the role of corporations in technology transfer. The expertise, perspective, and insights of the business and industrial sectors should be available to governments for discussions or negotiations on matters concerning business. Further, the United States Government should encourage developing country governments to recognize the role of the private sector in their own countries and to include private sector representatives on their own delegations.

31 Establish a study and evaluation center in the U.S. for developing country government technocrats to increase the availability of qualified managers of the transfer of technology. (There is much relevant experience to be drawn from the Department of Defense training programs for foreign officials and military experts). The objectives of such a center would be to provide participants with an opportunity to review and assess the impact of government policies on technology flows and to acquaint them with new concepts, methodologies, and perspectives. Provisions should be made for U.S. business to cooperate closely with the program implementation of such a center.

Role of Intergovernmental Organizations

Certain programs of intergovernmental organizations and, in particular, of agencies of the United Nations have been counterproductive in establishing closer economic rela-

tions between developed and developing countries and in furthering the dialogue necessary for effective policy formulation and implementation. The example cited most often by U.S. business executives is the Code of Conduct for the Transfer of Technology currently being negotiated at the United Nations Conference on Trade and Development (UNCTAD). Such negotiating efforts emphasize the tensions that exist between industrialized and developing nations and do not contribute to solutions of the basic problems causing those tensions.

32 Efforts should be made to encourage a more realistic dialogue reflecting the legitimate concerns and needs of all parties. Such discussions should focus first on an exchange of information concerning the main characteristics of the environment for technology transfers and the conditions necessary to encourage more effective transfer and development of technology. To further encourage such exchanges, the United States Government, U.S. companies, and developing country governments should attempt to develop useful information on technology transfers, but without placing further reporting demands (additional costs) on supplier companies.

Appendix III. "Proposals for Further Advancement of Appropriate Technology," and Consideration for the U.S. Delegation to UNCSTD," from Winrock International Workshop on Appropriate Technology.

Source: Proceedings of a Workshop on Appropriate Technology, December 1-5, 1978, Winrock International Conference Center, Morrilton, Arkansas, 1978, pp. 36-38.

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Proceedings of a Workshop

Appropriate Technology

December 1-5, 1978
Winrock International Conference Center
Morrilton, Arkansas

Funded by:

Office of the U.S. Coordinator
U.N. Conference on Science and
Technology for Development
State Department
Washington, D.C.

Proposals for the Further Advancement of Appropriate Technology

- o Appropriate technology should be placed on the UNCSTD Agenda.

- o The U.S. Delegation should include at least four AT delegates working in the development of appropriate technologies.

- o U.S.A.I.D. should review technology in all its projects as well as the technology used by A.I.D. employees who are working in developing countries.

- o Evaluations should be made which assess the impact of technologies provided through U.N. or U.S. assistance programs in fields such as irrigation, health, agriculture, housing energy and transportation.

- o Mechanisms should be developed by organizations such as A.I.D. and other U.S., international and regional organizations engaged in AT programs to provide for on-site visits and training with other AT efforts. Among the mechanisms might be U.N. travelling fellowships in appropriate technology.

- o Mechanisms for funding AT at the regional level should be established by appropriate specialized agencies of the U.N.

- o Funding for AT activities in developing countries should be channeled through AT networks, not government agencies.

- o Individuals and business enterprises have conducted considerable research on technologies which have proved not profitable in their particular application. On the assumption that such technologies

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might be applied with success in other situations under other conditions, efforts should be made by institutions such as ATI, VITA, BRACE, GRET, TOOL, and ITDG to collect and analyze these case histories in order that these technologies may be considered for more promising introductions avoiding errors of earlier applications.

- o Prior to the introduction of a new technology in an LDC provision funding should be made by the donor agency, multinational corporation or host government, whichever is appropriate, to prepare an initial assessment of its potential impact upon development goals of that country.

- o AT projects should be designed to ensure that control rests with local communities and should be provided with the means to share the experience of AT practitioners conducting similar activities elsewhere.

Considerations for the U.S. Delegation to UNCSTD

- o Application of appropriate technology is as important for the United States as it is for other countries, and all language that suggests paternalism should be removed.

- o Appropriate technology is a legitimate technology alternative and should not be viewed or described by such terms as backward, second-rate or low-level.

- o Appropriate technology utilizes the best of both old and new technology and should be viewed and described as a modern approach.

- o All appropriate technology introduced into a country should take account of the national development plan of that country. In connection with this, account must be taken of a country's social, cultural and educational policies.

- o The United States should give equal weight to economic, social and environmental priorities involved in applying appropriate technology.

- o Technical cooperation between developing nations would be greatly enhanced by careful selection of AT advisors who are culturally acceptable to the country involved.

- o The United States should emphasize, encourage, support and strengthen simplified and decentralized mechanisms for small-sum funding, accessible to small groups or individuals who may lack "official" status and who have not qualified before for funding by mainstream sources of development finance.

Appendix IV. "Summary," from Science and Technology for Development: Organized Labor's Concerns. AAAS Workshop, 1979.

Source: Report on AAAS-Sponsored Workshop on Science and Technology for Development: Organized Labor's Concerns. Held on May 7-8, 1979, at the Brookings Institution, Washington, D.C., By Joseph Mintzes, Rapporteur, June 15, 1979, pp. 1-6.

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REPORT ON AAAS-SPONSORED WORKSHOP

ON

SCIENCE AND TECHNOLOGY FOR DEVELOPMENT: ORGANIZED LABOR'S CONCERNS

Held on May 7-8, 1979
at Brookings Institution
Washington, D.C.

by
Joseph Mintzes
(Rapporteur)

NOTE: This report has been submitted to the Department of State in connection with preparations for the U.N. Conference on Science and Technology for Development. Copies of the agenda for the workshop and list of attendees are attached. Papers and notes prepared for presentations of agenda items II through VI have also been forwarded to the Department of State. Copies are available upon request.

June 15, 1979

Summary

Organized labor's concerns over U.S. technology and international economic policies with respect to developing countries were aired at a May 7-8, 1979, workshop sponsored by the AAAS in connection with preparatory work for the upcoming U.N. Conference on Science and Technology for Development (UNCSTD). Authorities from labor, industry, the academic community and government responded to an invitation from Ambassador Jean Wilkowski for a free exchange of views which could be taken into account in considering U.S. positions for UNCSTD which will convene in August in Vienna.

Fear of job losses due to growing U.S. imports from LDCs that might be further stimulated by possible U.S. government policies toward the developing countries at UNCSTD was a pervasive theme of labor representatives throughout the workshop. In particular, they singled out U.S.-based multinational corporations (MNCs) as the major source of technology transfers which have enhanced export capabilities of LDCs. Rising output from U.S. subsidiaries in the developing countries was seen by trade union experts as a major source of U.S. imports as well as a replacement for U.S. exports to certain foreign markets. The trade trends, in turn, have been accompanied by declining employment in important U.S. manufacturing industries.

These labor concerns were not assuaged by statistical evidence which showed that the domestic impact of imports from developing countries was of minor proportions when compared with other factors affecting employment

in U.S. manufacturing industries. Estimates presented to the workshop indicated that changes in productivity and demand had a much greater negative impact on domestic employment levels than imports in practically all the U.S. import-competing industries in which LDCs have acquired export capabilities. Observations that job-creation effects of growing U.S. exports to developing countries often more than offset the negative potential employment effects were of little avail in meeting the basic complaints of trade unionists. The latter pointed to limited labor mobility characteristics of many of the workers in U.S. industries affected by imports from LDCs that did not qualify them for job openings in the exporting industries. However, there was wide agreement that significant progress toward a full employment economy with declines in persistent high unemployment levels would help meet labor's concerns. Some participants also favored a greater government role in industrial policy and economic planning to meet problems of growing import competition.

U.S. trade adjustment assistance (TAA), which includes more liberal provisions than normal unemployment compensation for qualified workers who are displaced by import competition, was considered inadequate as far as compensation is concerned. TAA's time-consuming procedures and its ineffectiveness with respect to adjustment (i.e. finding new jobs) were also criticized. One labor spokesman, who appeared to reflect a widely held view among the trade unionists, favored trade measures such as orderly marketing agreements (OMAs) over TAA to meet labor displacement problems in import-competing industries. Another labor discussant advocated a more liberal TAA compensation scheme on the order of arrangements

made for redundant railway workers and more recently for workers displaced by the extension of public parkland in California's redwood forests. The proposal was intended to compensate workers for their lost "property rights" to jobs which were preempted for the common good on the order of the principle of eminent domain. This labor participant also recommended an internationally pooled trade adjustment assistance scheme to be financed as far as possible by export levies. Some discussants favored special adjustment assistance for workers displaced because of operations of MNCs. Others advocated an active manpower policy in the U.S. that would adequately help all structurally unemployed and thus obviate the need for special adjustment assistance such as TAA to certain categories of jobless workers.

Domestic job concerns of the trade unionists tended to overshadow considerations of science and technology issues which were reviewed at the workshop. One labor spokesman's observation that developing countries should shift development emphasis away from industrialization toward food self-sufficiency in agriculture was viewed by some development specialists as being unduly colored by this pervasive concern over the domestic employment impact of imports from the LDCs. There was widely shared agreement that balanced attention to both industry and agriculture was needed in most developing countries. It was noted that activities in both broad sectors were frequently interrelated.

Differing patterns among developing countries were stressed by development economists in countering what they saw as questionable generalizations. It was noted that the newly industrializing countries (NICs), the source of the bulk of U.S. imports from LDCs, represent only a relatively small number of Far Eastern countries (Taiwan, Korea,

Singapore, and Hong Kong) and the Latin American countries of Brazil and Mexico. Most developing countries are at much lower levels of industrialization -- those in Africa and some in Asia have hardly begun the process of industralization. For these countries, the choice between industry and agriculture was called a "non-issue." Some comments which appeared to exaggerate the role of U.S. and other developed countries in the LDCs drew the observation from a development authority that internal resources meet 90 percent of development requirements of the developing countries.

An inconclusive discussion centered on the idea of international fair labor standards which have been advocated for a number of years by American trade unionists. The labor proponents of this approach favor an international institutional framework such as General Agreement on Tariffs and Trade (GATT) to oversee a procedure that would tie the opening of trade opportunities to compliance with international labor standards in export industries. These standards would relate to labor income and working conditions such as occupational safety, health and environmental protection, trade union rights, collective bargaining, child labor, etc. Among other than the labor discussants, some questions were raised on whether this proposal was protectionist in intent and on its feasibility in view of implied intervention in sovereign states. A labor discussant refuted these concerns, pointing to the history of the proposal which was launched in the Havana Charter for a U.N. International Trade Organization and was subsequently endorsed by the Roth Report and the Williams Commission that dealt with U.S. trade and international economic policy. Some development economists claimed that the income effects of the proposal would

tend to favor the "haves" in the urban industrial labor force of most LDCs as contrasted with the "have nots" in the largely rural populations and among the unemployed and underemployed. Effects of high wages in Venezuelan oil and iron ore industries were cited to dispute this view. One labor specialist suggested that, in view of the lack of progress on this complicated proposal after 30 years of effort, it should be abandoned.

An industry representative claimed that an open flow of ideas meets U.S. self-interest. It would not be possible for a free society to cut off this flow at the border. He saw a role for collective bargaining with respect to provisions on technological displacement of workers. However, he differed with some trade union discussants on the feasibility of international collective bargaining with MNCs in light of differing national situations and practices.

In describing the plight of much of the developing world, a development economist cited pervasive unemployment and underemployment that represent as much as 40 percent of the labor force. Joblessness was characterized as the worst indignity that people could suffer. Having work, therefore, could be considered as a key human right. This theme was echoed by a trade union spokesman who also applied it to unemployed workers in the U.S.

In summarizing issues that bear on the North-South dialogue on science and technology, a development economist suggested ways of reconciling short-term labor concerns with longer-term development requirements. Costs of alleviating the social impact in the U.S. may mean some slowing of the rate of technology transfers to the LDCs. U.S. production-sharing

arrangements with developing countries might reduce domestic job losses by enabling certain industries to remain viable. Economic cooperation of developing countries should be encouraged so that more trade would be carried on among them.

Chairman Guyford Stever concluded the meeting by urging American labor to join in the important task of educating the developing countries. He reminded the workshop of the important distinctions made between NICs and the bulk of the developing countries where labor's potential contribution could be significant.

Appendix V. "Recommendations for Action by the United States," from Building National Institutions for Science and Technology in Developing Countries, AAAS Workshop, 1979.

Source: Building National Institutions for Science and Technology in Developing Countries. Proceedings of a Workshop Held Under the Auspices of the American Association for he Advancement of Science, April 18-19, 1979, Charles V. Kidd, ed., Washington, D.C., May 1979, pp. ii, 8-24.

BUILDING NATIONAL INSTITUTIONS FOR SCIENCE AND TECHNOLOGY

IN

DEVELOPING COUNTRIES

Proceedings of a Workshop Held Under the Auspices
of
The American Association for the Advancement of Science

April 18-19, 1979

Charles V. Kidd, Editor
Washington, D.C., May 1979

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II. Recommendations for Action by the United States

Ambassador Jean Wilkowski asked the group to present recommendations for consideration by her Office and by the U.S. Advisory Commission for the U.N. Conference on Science and Technology for Development. The proposals which follow are drawn from the papers and discussion at the meeting. They represent a general consensus although there was not complete agreement on all points. Since the suggestions are drawn from a number of sources, they differ in scale and in manner of presentation. The suggestions fall in three groups -- proposals for action by the United States, suggestions for action by developing countries to which the United States might contribute and suggestions for objectives to be sought by the United Nations Conference on Science and Technology for Development (UNCSTD). They are presented in that order.

The papers themselves contain many sound general recommendations in the form of suggestions as to how the problems of development should be analyzed and approached. The Ramesh, Weiss, Kamenetzky paper, for example, stresses explicitly the seldom emphasized point of the vital importance of taking into account the full range of relevant "non R&D" institutions which often influence the amount, characteristics and rate of diffusion of technology more than those institutions with R&D missions. Such significant ideas cannot be translated into "action items," but they are often more influential than specific, limited proposals. For this reason, the recommendations of the workshop in a full sense can be understood only by reading the papers.

A. Respect the Goals of Developing Countries

Developing and developed countries should set their own priorities and these should be respected. Cooperation is possible when there is

reasonable correspondence among these goals. Industrialization and generation of jobs are important on the agenda of most developing countries. Overemphasis by the United States on its priorities -- for example, basic human needs and dangers to the global commons -- to the exclusion of other goals -- such as creation of an industrial base and more efficient processing of natural resources -- will be viewed by many developing countries with suspicion if not antagonism.

B. Establish an Institute for Scientific and Technological Cooperation

The sense of the conference was that the United States had not used or helped developing countries to use science and technology with full effectiveness as tool for economic and national development, and that collaboration with the more advanced countries in particular, in activities involving science and technology had been inadequate.

The most significant recent institutional development affecting the use of science and technology for development by the United States is the proposal to establish a new Institute for Scientific and Technological Cooperation. Further discussion of the Institute brought out these points of general agreement:

1. Prompt enactment of legislation establishing the Institute would be in the national interest;
2. It is important that the Institute have a substantial degree of autonomy with and diverse support from a strong advisory group or governing board;
3. Foreign nationals, with understanding of an experience in both developing and developed countries and with independence from their governments, should serve as members of such a group,

following the successful precedents set by other developed countries;

4. The new Institute should place heavy emphasis on long range institution building and on continuity of support for carefully selected areas of emphasis, as contrasted with short range support of a large number of projects.

5. The new Institute must be established under circumstances which establish its capacity to recruit a substantial proportion of the staff from universities, industry, other countries and other non-federal sources on a revolving basis.

6. While a new organization with specific capacity to use science and technology more effectively for development promises to add substantially to the capacity of the United States to collaborate with developing countries, it would be well to understate rather than overstate its potentialities because developing countries have in the past found that the United States has promised more than it has delivered.

7. The ISTC should rely on the tremendous potential for transfer of technology from two sources -- smaller firms in the United States and experts in community action in the United States.

C. Use Non-Governmental Organization More

So far as the United States is concerned, cooperation with developing countries in building institutional capacity should be based to a substantial degree on non-governmental and quasi-governmental organizations. Institution building almost always involves delicate internal political problems. Organizations such as universities, foundations and professional societies

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are often better equipped to work in such an environment than are official agencies, and they should be called upon more by the U.S. government.

Some inherent limitations of governmental channels further emphasize the essentiality of informal relationships. Governmental relationships tend to be means of expressing national interests as these are interpreted by governments. Those interpretations of national interest are quite different from national interest as defined by scientists. To a degree never achieved by national governments or by the United Nations, science is an international enterprise. Scientists tend to interpret national interest in terms of a cooperative effort to advance knowledge, and this is an approach to relations between developed and developing countries that should strongly complement efforts in a governmental framework. Moreover, the governmental approach is often in practice the uncoordinated total of the policies and programs of a number of semi-autonomous agencies. This complicates the task of collaboration through government. These realities are additional reasons for greater emphasis on non-governmental channels as agents for collaborative efforts.

D. Expand Manpower Development Efforts

A theme reiterated in a number of papers is the significance of the development of manpower as a prerequisite to economic and national development of developing countries.

Concern for manpower development and utilization is inextricably tied with all aspects of institutional development. Since educational institutions in many developing countries are now increasing their output faster than demand, demand-oriented strategies ought to receive more emphasis.

Over the past decades, the U.S. has been closely involved both in institutional development in the less developed countries and in the education and training of large numbers of foreign nationals in U.S. educational institutions and in government laboratories and industry. Not just enlightened self-interest but also the broader humanitarian and cultural concerns of the nation require that such activities continue, but be adapted to meet changing needs, capacities and aspirations of the developing countries. Collaboration in development is a two-way street with opportunities to learn and to teach. Artificial barriers to the free flow of people in search of knowledge and understanding is ultimately counter-productive.

The following are some specific initiatives that are worthy of consideration:[1]

1. Improve Capacity for Manpower Planning and Supply and Demand Forecasting.

The U.S. has through its aid programs given much attention to the questions of employment and unemployment in the developing countries. The focusing of these concerns on the critical areas of science and technology is a pressing need. Assistance to LDC efforts could take several forms depending on the country and problem area:

(a) Creation of cadres of manpower analysts in appropriate institutional settings in the LDC's to improve such things as methodologies of manpower forecastings, wage

[1]Based on suggestions by Rao, Schweitzer and Useem, as modified by discussion.

and salary surveys, research on occupational choice and information on employment opportunities;

(b) Establishment of manpower data banks and promotion of annual assessments of high level manpower.

(c) Support for "state-of-the-art" review of manpower needs in specific problem areas and in critical occupations.

(d) Collaboration with central bodies such as research councils in high level manpower analyses and in the general area of science and technology policy analysis.

2. Study of the Characteristics of Scientists and Engineers

Too little is known about the characteristics, working environment, values, motivation and productivity of scientists and engineers in developing countries. More extensive research on these matters would benefit both developing and developed countries.

The current debate over the goals of development, and over the contributions of science and technology to these goals, led to the suggestion that the United States urge the United Nations to sponsor research on the aspirations of the poor, the social aspects of the development and use of technology and the psychological and social aspects of the motivation of urban and rural workers.

3. Manpower Development Through Collaboration

Efforts are needed to refocus U.S. collaborative programs for manpower development in light of new needs perceived and articulated by the developing countries themselves. Illustrative

actions might include:

(a) Inter-university collaboration in research and curriculum development.

(b) Promoting regional networks in which U.S. universities would be included.

(c) Programs to enable U.S. professors to teach and do research overseas.

(d) Collaborative arrangements in sub-professional technology programs.

(e) Increased emphasis on management education and especially the management of technology-based interprises.

(f) Transfer of knowledge and experience in the organization and management of student loan and scholarship programs.

(g) Transfer of experience in education and training for women and other disadvantaged groups in technology fields.

(h) Promotion in U.S. universities of curricular and non-curricular initiatives to adapt programs for the special needs of developing country students.

4. Stress Training of Technicians

In considering the development of manpower, there was a consensus on the point that training of technicians ranked in importançe with the training of scientists and engineers. The thought on this subject that emerged is the need to elevate the social status and prestige of technicians and institutions for training them and to make training more directly relevant to actual job requirements. In many countries, young people would rather be

an unemployed university graduate than an employed technician.

5. Revive the SEED Programs

Revive the program for sending individual U.S. scientists and engineers to laboratories in developing countries. (This is the program, Scientists and Engineers in Economic Development, administered by NSF and recently abolished.) The program has been repeatedly evaluated and found to be a very successful low-cost program. The Department of State should take the lead in sorting out whether AID, NSF, or ISTC should assume responsibility, but this success story should not be allowed to die.

6. Improve Programs for Foreign Students in the U.S.

(a) No Diluted Engineering Courses for Foreign Students

Foreign engineering students are typically required to undertake unpredictable and often unprecendented tasks. A high premium is placed upon initiative, responsibility, ingenuity and adaptability. Rigorous training in basics is the best way to inculcate these characteristics. Curricula diluted to meet what are mistakenly interpreted as the needs of foreign students are no favor to the students. At the graduate level, there are well known means of linking work to conditions and problems in the home country. These include writing theses on indigenous problems.

(b) Counsel Prospective Foreign Students More Effectively

The International Communication Agency should strengthen its student counseling services throughout the developing

countries. Given the myriad of universities and colleges in the United States, the optimum matching of prospective students with the most appropriate schools will never be achieved. However, a little advice can go a long way in reducing obvious mismatches. The problem is further confused as a number of U.S. institutions of dubious standing expand their recruitment programs in the developing countries.

7. Use the Peace Corps to Upgrade Secondary School Science and Technology Teaching

Critical to the upgrading of science and engineering education at the university level is an upgrading of the quality of technical preparation at the secondary school level. The Peace Corps, which has been retrenching under the basic needs philosophy, should show greater flexibility and should expand its programs for the teaching of science and mathematics in secondary schools. The need is acute and the United States is well equipped to help fill the void.

8. Train "Jacks of All Trades" for the Urban Poor

The United States should support efforts of developing countries to train people who are capable of translating technologies into forms usable in poor rural areas and capable of eliciting and developing the ideas of villagers.

E. Improve Communications

It is generally agreed that the flow of scientific and technological information both within and to developing countries is inadequate, but how the flow can be made more adequate is controversial. The conferees agreed upon these general policies:

1. Increased attention should be paid to the flow of information field by field and problem by problem. Large, general purpose automated information storage and retrieval systems designed to provide information on many topics on demand to developing countries are expensive and ineffective.
2. Multiple formal and informal channels should be used to convey information -- the telephone, visits, consultants, journals and specialized information systems.

The group also reached a consensus on three specific proposals for the United States.

1. Establish a New Journal of Scientific and Technological Information for LDC's

   The United States, with the International Communication Agency taking the lead, should consider producing a new publication -- a Journal of Scientific and Technological Information -- directed to developing countries. The journal would publicize the existence of organized sources of information on science and technology in this country, describe the problems and opportunities in securing access to technological information, present information on

important topics -- such as particular strengths of individual higher education institutions in the United States -- in special issues, review articles with citations on the state of technology in selected areas, and book reviews. Such a journal should complement existing publications (e.g., Interciencia). It would not only present needed information but would be a tangible demonstration of the willingness of the U.S. to share information.

2. Enhance the Effectiveness of Existing Science and Technology Communications Networks

There are throughout the world many effective networks for transmission of information on science and technology. The United States could collaborate in making these more effective, with a large return from a small investment. Initiatives in this area could include support for regional and national science and technology associations and especially those concerned with technology matters. This is best done through central bodies in the developing countries and with the help of U.S. professional associations. Increased support for U.S. participation in international conferences is needed to sensitize and inform members of the U.S. private enterprise, and governmental and academic communities regarding the real needs and aspirations of the developing countries in the contemporary context when concepts of interdependence and autonomy are strangely at odds with each other.

3. Appoint Regional Science Attaches

Regional Science Attaches should be assigned in Southeast Asia and West Africa. The Department of State has little capability to keep abreast of science and technology developments in these two areas. A number of agencies and sponsoring technical programs in the regions, and the countries of these regions are anxious to strengthen their ties with the U.S. If ISTC comes into being, the situation will be even more chaotic. The "Billings model," involving a broadly experienced professional with a small budget for travel grants, that was so successful in Taiwan, would return significant dividends.

F. Promote Collaboration of U.S. Institutions with Relevant LDC Institutions

Science and technology institutions with varying interests and capabilities exist in almost all developing countries, with well established links to counterpart organizations in the industrialized countries. Similarly, large amounts of modern technology are in place throughout the world, often dependent on foreign sources for spare parts and maintenance. While many of these existing links need reinforcement and there is an expanding need for additional linkages, the initiation of new collaborative linkages must be sensitive to current international patterns lest well motivated additional efforts become counter-productive.

Collaborative efforts between relatively well developed science and technology institutions can often by very inexpensive -- perhaps

involving only a few airplane tickets. However, considerable time patience may be required to build up understanding among collaborators. During this formulative period -- usually measured in years -- interruptions in a developing relationship due to political or other factors can easily negate earlier progress. Of course, if institutional capabilities do not exist in both countries as the base for collaborative activities and institution building is required, the time and cost involved increase significantly, and the importance of uninterrupted interactions becomes a paramount concern.

The most fruitful types of collaboration are those that are designed to provide direct technical benefits to all of the participating institutions and individuals. Publication of joint research reports or joint development of products or processes soon after the initiation of a collaborative relationship can provide a good stimulus not only to the participants but also to the institution providing financial support for the activities.

International networks of collaborating research institutions have become an increasingly popular approach to solving problems of concern to many countries. These networks can be very effective when focused on quite explicit problems, when there is strong demand for their research products, and if political and bureaucratic interference is minimal. A frequent concern is that such networks can become easily separated from the on-the-ground problems in country-specific situations.

Finally, with regard to funding of collaborative efforts, the world is replete with examples of interesting collaborative programs that foundered because of insufficient financial support. Generally speaking, serious collaborative efforts should not be attempted in the absence of reasonable assurance that financial support would be available if the program develops along constructive lines. Hopefully, the funding would be provided in sufficiently large increments so that the collaborators can spend their time working on substantive problems and not simply searching for additional funding.

G. Support Industrial Innovation in the Developing Countries

Industrial innovation transcends purely research and development activities and includes a variety of activities of private firms and entrepreneurs who assume the risks to bring technical ideas to the market. This is a rather wide field of endeavor and might also include activities to prove innovation in agriculture and social or public technologies. Among the variety of initiatives needed, the following illustrate what the United States could do more effectively:

1. Increase support studies on industrial innovation in the developing countries, including the effectiveness of LDC government approaches to stimulation of technological innovation.

2. Promote cooperation between U.S. small and medium enterprises with similar organizations in the developing countries.

e. Study venture capital availability and support to venture firms and development banks.

4. Analyze technology and manpower factors in large industrial and agricultural undertakings.
5. Study the factor mix in new technologies being considered by the developing countries and policies to optimize them in the context of LDC development.
6. Establish links between low-cost appropriate technology organizations in the developing world and appropriate U.S. institutions.
7. Study how multinational companies can further stimulate industrial innovation in the developing countries, and their manpower effects.

U.S. efforts in the field of industrial innovation tend to be confused by the existence in AID of a program designed to sell the services of U.S. government agencies and educational institutions to developing countries (The Reimbursable Development Program (RDP). This may be in the public interest. However, this objective should not be joined with objectives in the field of international development. Indeed, the two types of objectives can conflict in specific cases. The current situation of the RDP program representing the science and technology interests of the U.S. Government in dealings with middle tier countries, and in doing so giving the clear impression that the other countries must pay for both parties in any cooperative arrangement, needs to be corrected immediately. The program should be transferred to the Department of Commerce.

H. Goals for the U.S. at UNCSTD[1]

1. UNCSTD should avoid urging the establishment of, or actually setting up, new organizations and institutions, national or international

[1] Based upon suggestions by Moravcsik, as modified by discussion.

unless these are significantly different from the existing ones both in purpose and in structure. Organizational manipulations are highly unlikely to contribute to the amelioration of problems of science and technology in developing countries, and can very well result in a worsening of the situation by siphoning away needed manpower and funds and by diverting attention from truly effective remedies.

2. UNCSTD should stress programs involving person-to-person interaction. The value of close working relationships between individuals is often undervalued, and this mode of collaboration is relatively cheap. In addition, those participating in the workshop agreed that an important element of U.S. policy should be "to get more Americans out there;" not as technicians attached to AID projects but a individuals collaborating with scientific and engineering colleagues on research and development projects of mutual interest. Some developmental projects are large by nature and are essential. However, they also tend by nature to be costly and impersonal, characteristics which can be offset by complementary programs stressing collaboration among individuals. (The U.S. program Scientists and Engineers in Economic Development, noted in A above, is an example of such a program.)

3. UNCSTD should find ways of supporting specific programs which enhance the local interaction within the scientists and technologists of a given developing country, as well as the local interaction between scientists and engineers, between engineers and the productive sector, between scientists and science policy

personnel, and between scientists and engineers on the one hand, and the population at large, on the other.

4. Manpower is the key to a creative scientific and technological infrastructure, and quality in manpower development is crucial. Hence UNCSTD should emphasize the support of specific programs which stimulate the creation of high quality indigenous manpower in science and technology.

5. UNCSTD should propose means ensuring that international assistance is made more freely available to the developing countries for the purpose of making scientific and technical evaluations of particular research projects. Such an international network of referees, consultants, and assessors is already well established, in an informal way, within the scientists and engineers in the more advanced countries, and this network is very widely, in fact routinely, used in these countries for the assessment of past research, for decisions to support proposed research or development, and for the promotion and appointment of scientists and engineers. At the moment, the developing countries are, to a large extent, excluded from such a network, and this unsatisfactory situation must be altered.

6. Since there will be extensive discussion of the political aspects of the use of science and technology for development at UNCSTD, the U.S. delegation would benefit from discussion of substantive proposals made by engineers and scientists from other countries -- particularly the developing countries -- who may be at UNCSTD.

Appendix VI. "Report of Recommendations," from Workshop on Women and Development, AAAS Workshop, 1979.

Source: Report of Recommendations. AAAS Workshop on Women and Development, March 26-27, 1979, held at the Brookings Institution, Washington, D.C., Organized by Request of the Department of State, Prepared by Irene Tinker, pp. i - vi, 3-22.

REPORT OF RECOMMENDATIONS

AAAS WORKSHOP ON WOMEN AND DEVELOPMENT

MARCH 26 - 27, 1979

BROOKINGS INSTITUTION

WASHINGTON, D.C.

Organized by Request for

The Department of State

Under Contract #1019-966031

prepared by Irene Tinker

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BACKGROUND PAPERS

"Java, Indonesia: The Introduction of Rice Processing Technology"
Melinda L. Cain

"Can Technology Help Women Feed Their Families? Post Harvest Storage, Processing and Cooking; Some Observations"
Maryanne Dulansey

"The Plight of the Invisible Farmer: The Effect of National Agricultural Policy on Women"
Louise Fortmann

"Base-Line Study for Socio-Economic Evaluation of Tangaye Solar Installation"
Grace Hemmings-Gapihan

"Women in Iran: Technological Change and Social Transformation"
Daniel Lerner

"Petty Trade and Other Employment Options for the Uneducated Urban West African Women"
Barbara C. Lewis

"Women Workers in Multinational Corporations in Developing Countries"
Linda Y. C. Lim

"The Differential Impact of Programs and Policies on Women in Development"
Hanna Papanek

"The Role of African Women's Organizations in Identifying Needs for Labor Saving Devices"
Ireme M. Petty

"Prosperity and Poverty in Rural African Areas: Can Economic Development Take Place without Social Stratification or Inequality?"
Priscilla Reining

"Women with Banking, Finance and Entrepreneurial Ability"
Michaela Walsh

INTRODUCTION

The Workshop on Women and Development was the first of a series of four workshops conducted by the American Association for the Advancement of Science as requested by the U.S. Department of State as part of the U.S. preparations for UNCSTD. The 2-day workshop, held March 26-27, 1979 at the Brookings Institution, Washington, DC, involved thirty-eight participants, both men and women, with a variety of expertise in the field of women and development. Participants came from federal agencies (U.S.AID, DOE, OTA, NASA), universities, public sector organizations (League of Women Voters, Overseas Development Council, National Council of Negro Women), professional associations and The World Bank.

After an initial general session, participants broke up into three working groups to address the following topics -- national policy for development, education and training for development, and technology for development. Each group proposed recommendations which were then presented and discussed by the workshop as a whole. The following report, critiqued by participants, is a compilation of those recommendations, background information and supporting statements, and the eleven background papers commissioned for this workshop.

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AAAS WORKSHOP ON WOMEN AND DEVELOPMENT

EXECUTIVE SUMMARY

The dominant theme throughout the workshop and in the background papers was the centrality of "women and development" issues to all development planning. As even remote villages move into the monetary economy, there is need to improve traditional economic activities of women in the food chain and in the making of household goods through the introduction of new technologies. It is equally important to recognize the economic as well as social and psychological contributions which women make in feeding and caring for their families. As new technologies are introduced to reduce the drudgery of collecting fuel and water, it is imperative to understand the implications of moving the cost for water and fuel from human time to money. This shift requires even greater attention to income-producing activities for women, whether of small scale or through modern industry.

The modernization of the economy is requiring women to buy food and fuel and even water in order to meet traditional responsibilities and obligations, but few jobs in the modern sector are available to women where they can earn the money needed. Given the clearly defined sex roles and responsibilities in most traditional cultures, money earned by the male head of household will not necessarily be used to meet the responsibilities of females. Poor women con-

tinue to feed their families by their own efforts, whether a man is present in the family or not. The workshop therefore focussed its recommendations first on technology to assist women in providing basic needs for her family: energy, food, water; and secondly on technologies to provide new income.

The discussion of these interlocking activities of women was marked throughout by the realization that national and international development and trade policies reach into every home. Price supports, import subsidies, cash crops for export, currency control, all affect the way in which international trade impinges on local agriculture and manufacturing. National planners tend to overlook the economic activity of women when setting national policies precisely because of the insufficiencies and inaccuracies of statistics and other data on the informal sector, where the bulk of women work. Thus a government monopoly on peanut processing designed to raise the export price of the commodity also destroyed the local processing and sale of peanuts by women while at the same time depriving the poor of needed oil in their diets. Planning agencies in all countries need to collect better information about the actual economic roles of women and children, and to consider the costs of adding these workers to the list of unemployed, whenever they weigh the merits of a particular development strategy.

Similarly, development projects for women, whether nationally or internationally funded, should be considered in light of national development goals. Too often women's projects are considered peripheral to mainstream development or are perceived of as welfare programs rather than as economic activities. A recent laudable effort by an African government to improve the quality and quantity of millet being produced by a woman's cooperative was jeopardized by

the granting of import and tax credits to enable Heineken's to manufacture and sell its beer at competitive prices. It is imperative that development planners understand the implications to women and their children, as well as to men, of import policies which undercut local manufacturing.

It was recognized that income-generating projects for women cannot be developed independent of programs to link up women with the banking and financing institutions of their countries and localities and thus with the local and national economy. Women represent an important market for banking services which has largely been ignored. It was underscored that development planners should clearly understand that credit is a means to an end; it should not be taken as the starting point for income-generating projects, but rather as a supplement to an enterprise which has a sound base of operations and marketing strategy.

Recommendations:

The United Nations Conference on Science and Technology is the last major international conference in the Second Development Decade series. As such it is the culmination of international effort to focus all UN activities toward development. Because the subject of the workshop was "women and development", many of our recommendations are as equally appropriate to other fora as to UNCSTD. We call upon the Department of State to carry to all appropriate international conferences the message that throughout the development process the contributions of women to the national economy must be sustained and encouraged.

Our recommendations specifically for the UNCSTD give priority to two vital areas where technology can contribute immediate solutions. The first recommendation responds

specifically to the call by the Secretary-General of the Conference for worldwide projects. In terms of the Preliminary Draft Programme of Action, these recommendations are directed toward national action to improve the planning and use of science and technology (Target area A); B (ii) also underscores the importance of ensuring that technological transfer benefits the workers as well as the owners of new industry (Target Area B).

We urge that the US delegation go to the UNCSTD prepared to support international efforts:

A. to develop a worldwide pilot project to assess present and changing uses and supplies of household energy, (Recommendations 1, 2, 3, 9, 10);

B. to increase income-producing activities for women:

   (i) - in the traditional and informal sectors through projects designed to improve technologies

   (ii)- in the modern sector through efforts to reduce the exploitative tendencies of industrialization, (Recommendations 4, 5, 6, 7, 11).

Underlying this theme of viewing women's needs as an integral part of all development is the recognition of women as a development resource. Women have always contributed greatly to the economic activity of every country. As development proceeds, it is essential that women be given access to formal and informal education at all levels, through all forms of media, so that they will have the scientific and technical skills to participate fully in more modern economic activity. Further, women must be included in policy and decision-making bodies at all levels from the national planning or research institute to village meetings.

Our recommendations focus in two priority areas: scientific and technical education for women professionals, and skill training for poor, illiterate women. Within the Draft Programme of Action these recommendations fall within Target area A because they enhance endogenous capabilities of half the population while increasing the capability and effectiveness of policy-making by adding the dimension of women to national planning. We ask the US delegation:

C. to initiate or support resolutions to increase the number of professional women in agricultural research institutes, agricultural extension services and training centers, and community development agencies

(i) - to ensure utilization of professional women

(ii)- and to enhance communication with the women these services are meant to serve, (Recommendations 15, 17, 18);

D. to support and target money for vastly increased training by UN regional commissions of women to act as local trainers to ensure that technology is explained to the users and that the users are trained in its use, (Recommendations 10, 11, 14, 19);

E. to support a series of suggestions to UNESCO, IDCA, and professional associations for increasing the visibility and effectiveness of women scientists by granting prizes, issuing conference invitations, and awarding fellowships (Recommendations 13, 16, 10, 21).

We further ask the US delegation:

F. to support improved data collection on women's development activities and on women scientists and engineers around the world today, (Recommendations 8, 12).

We have asked that reports on these activities and on the development of standards for water supply and employment guidelines be presented to the International Women's Mid-Decade Conference to be held in Copenhagen in July 1980. (Recommendations 4, 6)

Because we value women as major human resources, we ask the US Department of State:

G. to include at least four women on the UNCSTD delegation in order to ensure representation by women from each of the concerned groups: the scientific community, the non-governmental organization, scholars versed in women and development issues, and professionals in the Department of State;

H. to appoint immediately a woman at ambassadorial level to coordinate US activities for the International Women's Mid-Decade Conference, and delegate to her on-going oversight of the recommendations made by this workshop.

RECOMMENDATIONS

The twenty-one recommendations made by the AAAS Workshop on Women and Development have been grouped below into two categories:

I. Recommendations Concerning Integrated Planning, and

II. Recommendations concerning the inclusion sion of Women in the Making of Technology Policy.

With each section the recommendations are listed according to the body which is designated to implement the recommendation: international or multi-lateral agencies; national governments of developing countries; the U.S. government; professional associations.

I. Recommendations Concerning Integrated Planning

Recognizing the all-encompassing nature of women's involvement in development, the workshop participants agreed upon a series of recommendations aimed at fostering the inclusion of women's concerns in integrated development planning rather than encouraging exclusive emphasis on separate women's projects. Such planning must include an analysis of the impact on women of all development policies in order to formulate ways of avoiding harm and maximizing benefits. It is important to emphasize the role of women in families, whether or not a man is present, and to see the family unit as a key element in designing and evaluating policies. A specific focus on women needs to be included in the planning process, taking into account the similarities and differences among women in different economic classes, between urban and rural women, and between agricultural and industrial sectors. The ultimate aim of all these recommendations is to develop policy that makes research on women's concerns and activities integral to all program sectors.

A. Recommendations to International Bodies

We support the suggestions of the Secretary General of UNCSTD that a number of pilot projects demonstrating the effective use of science and technology for development be designated at the Conference to be cooperatively developed and implemented by agencies of the UN system.

1. *Women should have equal access to and participate in all these projects at every stage, including identification, formulation, appraisal, planning, design, implementation, and evaluation. In every case the impact of these projects on women and family life should be considered.*

To illustrate the kinds of questions that should be considered in order to make the concerns of and impacts on women operative, we have prepared a checklist of the types of questions that should be asked when considering the introduction of technologies intended to benefit poor woemn. (Annex A) We have also identified five major project areas that address problems of high priority for the welfare of women and families. Two of these lend themselves to UNCSTD pilot projects, two support activities relating to other UN Conferences, and one addresses the need for income-producing projects for women across the entire span of assistance activities.

Household Energy

2. *We recommend that one of the international pilot projects sponsored by UNCSTD focus on present and changing uses and supplies of household energy.*

Each of the regions of the developing world should undertake at least one pilot project, encompassing both urban and rural areas, to improve available household energy by introducing new technologies for meeting the energy needs of households. Both improved traditional and modern methods of providing energy should be offered for choice by the cooperating households. The role of science and technology in improving the efficiency of energy use should be emphasized. It is recognized that the continuing heavy use of certain traditional technologies and sources (e.g., firewood) involves increasing social and economic costs. Technologies

should therefore focus not only on improving existing technologies and supplies, but also on devising new, especially renewable, energy sources and processes. Existing technologies to be considered include a variety of stoves (mud, pressure, oil-wick, kerosene), of energy sources (biomass, biogas, electrcity, firewood), and of processes (e.g., hot water pans, grain driers, etc.) A sample project is included in Annex B.

3. *The UN Conference on Renewable Energy Resources scheduled for 1981 should call upon member nations to provide information on present and projected household energy use and supply, both urban and rural.*

It has been customary to account for national energy needs only in terms of the commercial energy resources--oil, coal, natural gas, hydroelectricity and nuclear fuels. This conventional energy-accounting procedure, however, fails to account for most of rural energy uses in the developing countries. Fuelwood (firewood, charcoal and crop residues) accounts for two-thirds of all energy (other than human and animal energy) used in Africa and for one-fifth in Latin America. In India, Pakistan, and Bangladesh, where noncommercial fuels account for about 90 percent of total domestic consumption, nearly half is supplied by dung.(13)

Because the majority of the population in most developing countries lives in the rural areas, which in general are not served by an electrical power distribution system, they do not realize any of the direct energy benefits of the commercial power generating system. Instead the vast majority of the rural population--and the urban poor as well, who cannot afford electricity either--rely on these non-commercial energy resources. Improved information sources on present usage and changing supplies must become part of world planning on energy.

Modern Industry

4. *We recommend that one pilot project examine the socio-economic implications of the drive for technological transfer and rapid industrialization worldwide. The relationship between modern industry employers of women in developing countries and the impact of that employment upon the status of women should be more carefully assessed.*

The employment of women in labor-intensive export industries in some developing countries is a highly contentious area of concern. Trade unions in the developed countries fear the export of jobs; women and men concerned with fair labor standards worry about depressed wages and rapid labor turn-over.(14) Therefore, a project should be initiated in a selected number of countries for which interested United Nations agencies, such as UNIDO, UNCTAD, and ILO, would be called upon to participate as would industrial companies, indigenous voluntary groups, and the Women's Voluntary Fund. A first output would be a set of work guidelines specifically concerning women. Progress on these guidelines should be reported to the International Women's Mid-Decade Conference in 1980.

Giving attention to women's concerns within major UN agencies should lead to the integration of these issues in the international codes of conduct being formulated with reference to multinational corporations. In addition, the appropriate UN agency could evolve a set of criteria for foreign private investment in developing countries which would constitute a development impact statement analogous to the environmental impact statements now required for certain kinds of projects. In this way, the focus on women's problems could have a much broader development effect.

Agriculture

5. *We recommend that programs both at FAO and at the established international agricultural research institutes link research on women in agriculture to broad theoretical concerns with technological development. Extension assistance should be directed towards improving the productivity of subsistence crops, small animal raising, and garden farming.*

Because these activities are primarily the responsibility of women, assistance should also be directed towards women. Post-harvest food handling should be considered as important to increased productivity as research in new strains. Specific projects introducing new technologies for farm and food-related activities of women should be jointly developed by the agricultural and technological agencies at regional levels.

New technologies for the agricultural activities carried out primarily by women, e.g., transplanting, breeding, processing and preserving, should receive greater emphasis. It is preferable that the technology not displace female labor, but instead, make their labor more efficient and productive. Many current income producing activities of women could be made more profitable with improved technology and consequently increased production. If the technology replaces human energy, then the control of that technology should be granted to those replaced. Too often technology has released women from drudgery but at the cost of reduced income, lowered status, and increased dependency.(15)

Water Supply

The rights of women farmers should be considered when providing water for irrigation. Particularly when providing irrigation to areas inhabited by pastoral societies, women's economic activities should be recognized and supported, or

alternative productive activities should be provided. Women's rights to land for agricultural use, which will be on the agenda at the World Conference on Agrarian Reform and Rural Development later this year (1979), is an important consideration in any project encouraging increased investment in agriculture.

> 6. *We support the resolutions of the UN Conference on HABITAT and the Water Conference which set a goal of clean water for everyone by 1990. In this connection, we recommend that an international working group be set up to establish minimum standards for water supply by amount of water and by cost in time or money. We further recommend that this group report its findings to the International Women's Mid-Decade Conference in 1980.*

Sanitary water supplies have been long considered a major goal of development, yet women and children still spend many hours fetching water for household use. Simple technologies such as tin roofs or plastic pipe can give women the gift of time--two to four hours more every day--to improve the quality of life of themselves and their families. Selling clean water can provide income and pay for installation. Safer wells and improved storage of water, can increase the supply, but improperly designed or poorly placed wells can endanger the water supply and degrade the land. Further, the provision of water must be coupled with water and waste management. A hierarchy of water systems should be developed which respond to the needs and resources of the community. Women should be trained in all aspects of water and water management in order to provide additional income producing activities to unskilled women and greater overall health benefits to the community.(16)

Income Producing Activities

7. *We urge that multi-lateral assistance agencies as well as USAID designate at least ten percent of their budget to projects designed to provide productive employment for women, both urban and rural. Such projects should balance technological development with training for the users.*

Women's economic activities are vital to the survival of poor families whether there is a man present or not. The lack of new income-generating employment combined with the diminution of traditional employment for women in agricultural handicraft and trading sectors is causing female unemployment of alarming proportions.(17)

Because of the lack and diminution of income generating employment for the least educated, it is necessary to explore options and alternatives. For example, the use and production of foreign technology entails the introduction of capital-intensive modern technology heavily subsidized by local government and populations when an intermediate indigenous technology might at least equally increase production, preserve foreign exchange and provide income-generating employment for those with little access to modern sector employment.(18)

Therefore, we suggest a program which will :

(a) identify goods and services responding to local needs which have traditionally been produced by women using indigenous technology, and

(b) identify technologies which will improve productivity and retain employment for these least educated women.

We recommend wider use of time allocation studies to identify women's tasks that can be made more efficient through new technologies. These technologies should satisfy local needs for products and services and be susceptible to

indigenous financial, managerial and technical direction. Priority should be given to products and services which meet basic needs as defined by the users. It is likely that the product so identified will accommodate the processing of locally available raw materials and the manufacturing of items for daily use, e.g., foods, especially weaning foods, partially prepared foods, preserved foods, easier-to-cook foods; household items, such as soap, medicinals, utensils, matches, fuel for cooking, furniture, implements for home and field, devices to store food and water; cloth and clothing, and means of transporting materials and people.

We emphasize the need to establish projects among the most disadvantaged in both rural and urban areas. Ongoing monitoring and evaluation, both by users and by indigenous groups, including redesign and dissemination, should be a feature of such projects.

While recognizing traditional occupational differentiation by sex, such projects should also open up new activities for women. For example, new activities such as fish ponds, business enterprises, or water management could be introduced to women as easily as to men; indeed they fall within the traditional service activities of women. The tendency has been to introduce new technologies only to men and then to interpret cultural traditions in such a way as to bar women from that activity.

Data Banks

A major problem in the designing of integrated development plans is the lack of statistics on women's economic activities, including the fetching of water and fuel, which beg for technological or scientific solutions. As the projects recommended above develop information and as research

institutes disaggregate the poor by sex, it is important that such information become part of the information contained in the international network of computerized data banks. There is a great resource of information on science and technology for development now available in data banks. It exists in many countries, but the greater part is in the United States where over $8 billion has been invested in the generation of such data. New developments in computer tele-communications and in search technology can now make data bank information readily available as an important resource for development.

8. *We recommend that UNESCO sponsor a working group to review categories for information retrieval to ensure that women's special concerns are both separately coded and adequately cross-referenced, and that the group report its progress to the International Women's Mid-Decade Conference in 1980. In this manner, data will be available for integrated planning as well as for women's projects. We further urge developed countries to support this effort by utilizing the categories in their own data banks and by giving financial support to assist developing countries in establishing and maintaining compatible systems.*

B. Recommendations to National Governments

Each of the five major project areas noted above, household energy, modern industry, agricultural, water supply, and income-producing activities, also calls for priority action at the national level. These projects should be designed to demonstrate the contribution to local and national development that can be achieved when the great energies and talents of women as well as men are fully involved.

Household Energy

9. *Household energy needs should be made an integral part of each nation's energy policy. It is recognized that over 90 per cent of the rural energy supply and nearly 50% of the total*

energy consumed comes largely from non-commercial sources in the developing countries. Further, such energy is inefficiently used.(19)

Improved data need to be generated to measure both use and efficiency of non muscular energy used for the processing, preservation, and preparation of food, for heating water, or for lighting. However, the increasing scarcity of noncommercial fuels, their rising prices, and the widespread land degredation occuring as more and more trees are cut, require immediate attention to improved or alternative energy sources for poor households.

Participation

Emphasis was given throughout the seminar to the importance of consulting the user when introducing any technology. Too often new technologies have harmed those they were intended to benefit. The way that technologies are introduced--by whom, when, how; the social as well as economic costs, and the control were seen as equally critical to its utility as the technology itself. Particular attention should be paid to technologies which reduce the muscular energy required of women to ensure that release from drudgery does not place an even greater economic burden on them.

10. *A national monitoring system needs to be developed to ensure that at evey level new technologies introduced into developing countries take into account the needs of the users. Provision of and funding for such a monitoring system should be included in all internationally funded technology projects. Users should be part of any evaluation.*

The socio-economic impacts of new technologies should be evaluated to see who in fact benefits. When the intended users of technology are primarily women, or when the human energy being replaced has been provided primarily by women, the appropriate monitoring mechanism may be the National Women's Bureau or a local women's research center.

The workshop further emphasized that while national planning must integrate women's and men's concerns, the delivery systems may have to be separate in order to reach women directly.

An important resource in the identification, development and delivery of new technologies are existing networks and organizations that involve women. While individual women face restrictions in access to channels of information, technology, and opportunity in some societies, local women's and community groups are at various implementing stages suitable vehicles for disseminating technological information and supporting risk along locally defined lines.(20) Once aware of technological options, women users themselves decide their needs and priorities and spread information through existing communication networks. Simultaneously, peer support is available for the risk and experimentation sometimes associated with technological change.

11. *Women's groups and informal or community groups which include women as well as men should be involved in the selection, evaluation, and promotion of new technologies.*

II. Recommendations Concerning the Inclusion of Women in the Making of Technology Policy

The complex and demanding needs of all countries, and of the world, require the wise utilization of all national resources, and especially of all human resources. Women should have the opportunity both to select from the full range of professional and occupational roles and to be trained to fill those roles. When women are better equipped to participate in their society's economic development, national productivity and equity of economic distribution will be enhanced.

Education and training in science and technology are particularly crucial, yet throughout the world the percentage of

women in these fields is low. One reason may be the frequent exclusion of women from research and administrative jobs in the scientific and technical area because of cultural constraints or occupational segregation.

The workshop recommendations therefore stress not only education but access as well so that women may participate fully in the making of technology policy.

The critical need to involve women fully in the planning, selection, and use of science and technology to address problems of social and economic development, requires that development agencies undertake specific commitments in two priority areas: advanced training in both natural and social sciences and in technology; training of local women who are the end users of technology.

A. Recommendations to International Bodies

Despite discrimination throughout the educational process and despite societal pressures away from technical subjects, women scientists and engineers exist in nearly every country throughout the world. Prejudice and institutional conservatism frequently prevents these women from attaining jobs for which they were trained. We argue further that these women will be better qualified than men to provide the bridge to poor women.

Recognizing and Utilizing Women Professionals

12. *Data collected by the United Nations for the International Women's Mid-Decade Conference in 1980 should include information on the numbers of women in all scientific and technological occupations.*

This information should include descriptions of the variety of occupations open to women and a discussion of the factors which inhibit or encourage women professionals in the various fields.

13. *Annual prizes should be established for women scientists from Asia, Africa, and Latin America who have made important new contributions to social and economic needs.*

Such prizes should be offered by the United Nations through UNESCO or ECAST they should be coordinated with similar prizes recommended by participants in the Singapore International Symposium in Science and Technology for Development sponsored by the International Council of Scientific Unions in January 1979.

14. *The regional commissions should concentrate on programs which provide training for project managers and educators in methods of involving the users of technology in decisions about its selection, use, and control.*

The workshop participants stressed the importance of ensuring that local women and men be given sufficient information about technological alternatives so that they can make meaningful choices. Demonstration models trucked to local fairs or weekly markets provide hands-on experience; tape cassettes provide easy reference for illiterates; local dance and drama forms can be adapted to convey information about alternative technologies. All such media techniques should be widely and frequently used.

Most governmental bureaucrats tend to give orders rather than ask local citizens to define their needs. Cadres of personnel trained in community organization will be needed to facilitate opportunities for users to participate in decision-making. UN regional commissions could provide

technological information as well as design training manuals for national project managers. Special emphasis should be given to training in the use of new communications technology.

15. *The international agricultural research institutes should add women professionals to their staff to facilitate both research and extension services to women farmers and in agricultural-related activities.*

While these institutes do not make national policy, their research findings influence international agricultural policy. Currently their staffs are predominantly male. (21) We are convinced that the perspectives of women are necessary to ensure that women's roles in agriculture are recognized and that technological innovations are extended to women as well as men. We wish to stress the simultaneous need for improved service to women farmers along with additional research in crops more likely to be within the woman's domain.

16. *UNESCO should sponsor periodic small international conferences, bringing together both academic and nonacademic professionals engaged in work on women and development.*

There is no professional association at the present time representing the interests of scientists concerned with the impact of development on women, yet there is a need for women from different countries in different disciplines to compare research priorities and findings. Such contact should be more frequent than the occasional world conference, and more scientific than the program meetings visualized under the plan for the International Women's Institute.

Only through international exchange and visibility will sufficient attention be paid to developing the scientific capacity to understand the complex problems of women's

integration in development. Pioneering work has been done by individual scholars, usually isolated in universities and research institutes. Important information has been collected in many action projects and through the efforts of some national and international agencies. But an integrated approach to women and development issues requires that serious investments be made in (1) building the scientific capacity of individuals and (2) increasing the participation of such trained individuals in those institutions that conduct policy-relevant research in the field of women and development.

Emphasizing the need for integrated development planning, in addition to professional growth, scholars studying women and development should be included in all relevant conferences sponsored by UNESCO.

B. Recommendations to National Governments

The improvement of existing agricultural extension and community development services are imperative in order to mitigate the impact of deteriorating rural conditions in much of the world. Services to rural women, largely ignored in their farmer and entrepreneurial capacities, need substantial redirection. (22)

Utilizing Women Professionals

17. *Agricultural extension services should reflect the sex composition of the actual agricultural work force. Teams should include both male and female members in order to provide better communication with both male and female agricultural workers without disrupting cultural and social practices.*

In order to ensure a pool of qualified female extension agents, governments may need to reserve places in training

centers or universities so that women can receive education not only for home economics and food processing, but also for other types of agricultural sciences, e.g., crop propogation and improvements, fertilizing and pesticides, breeding, etc.(23) It is essential that women extension workers receive equal pay and the same prerequisities available to their male colleagues.

The international pilot projects involving the impact of technology on women which this AAAS Workshop has proposed relate either to women's responsibilities in the household, providing fuel and water, or to income-producing activities from homecrafts to industry. Women are best able to communicate with other women, both in eliciting and transmitting information. Professional women can also make a significant contribution to these projects as planners, creators, implementors, and evaluators. Without their participation, such projects will not succeed.

18. *Women should be included in rural and urban community development agencies which seek to introduce new technologies for household use or for income-producing activities, so that such technologies will be appropriate to women as well as men.*

Training Local Women

In the development process, women have been denied education and training which would lead to income earning opportunities. Although this process is changing for the present generation, in many less developed countries at least 90% of adult women still lack access to education and marketable skill training. Adult education classes in the past have tended to focus almost exclusively on literacy training.

19. *On site or informal training geared to upgrading existing skills or providing new marketable skills should be made available widely to women who have been denied access in the past.*

The types of training we are proposing should include:

i) small scale entrepreneurial activities;

ii) food processing techniques and production of crops for commercial purposes;

iii) maintenance and repair of agricultural machines;

iv) practical technical training with which they can earn a living and which should not necessarily depend on literacy;

v) training to organize credit unions and cooperatives

Such training generally reinforces group cooperation and contributes to a more positive self-image. As their horizons enlarge, women tend to increase their use of community resources already available to them thus improving the level of health, nutrition, and education of their families and their communities.

C. Recommendations to the United States Government

As the centerpiece of the U.S. Proposals for UNCSTD, the Institute for Scientific Technological Cooperation should become a model for the inclusion of women into the development process.

20. *We recommend (i) that women have a minimum of two fellowships designed for specific women's concerns in each of the five issue areas;*

ii) that there be created a staff position at the Deputy Assistant level devoted to promoting the participation of women in research and demonstration projects throughout the agency and in each regional office;

iii) that at least one million dollars annually for the first three years be used specifically for exchange and travel activities involving women scientists and technologists.

D. Recommendations to the AAAS and other professional associations

For development to succeed, the resources of women must be integrated into research project design. To provide information to make their inclusion meaningful, greater attention needs to be given to development oriented research concerning women in a social, political, and economic context. Women's special needs should be discussed and explored within the framework of general development theory.

21. *We call upon scientific associations and development agencies to include scholars familiar with women and development issues in all their meetings and deliberations. We further urge these associations and agencies to assure the continuing development of scientific capacity adequate to analyze the complex problems of women's integration in the development process through both basic and applied research.*

Existing methods of data collection and analysis pose special difficulties in the scientific study of women's participation in economic processes. The creation of an adequate infra-structure for basic and applied research on women and development issues is necessary to overcome existing institutional and attitudinal barriers to an integrated approach to research and planning in these areas. Particular attention must be paid to overcoming these barriers through the creation of an adequate body of information, methods of data collection and analysis, and means of communicating findings to an international and interdisciplinary group of researchers and policy-makers. Scholars isolated in universities and research institutes must receive greater support

for their work and should be integrated more fully into existing institutions concerned with these issues.

CONCLUSION

Modernization is essentially the process of substituting scientific findings and technological systems for traditional methods of providing human needs. Because the dominant development theories have ignored or downplayed women's contributions to the sustenance of family and community, women's roles have been increasingly limited and women's status frequently eroded. Specific focus on ensuring that new technologies reach women and address their needs will go a long way to redressing the balance.

The participants in the AAAS Workshop on Women and Development commend the Department of Status for recognizing the importance of including women in the development process by sponsoring this workshop. We urge the Secretary of State to instruct the U.S. delegation to the United Nations Conference on Science and Technology for Development to support wholeheartedly the recommendations submitted in this report.

* * * * * *

Appendix VII. "Summary Report [and Recommendations]," from The Role of Scientific and Engineering Societies in Development, AAAS Workshop, 1979.

Source: The Role of Scientific and Engineering Societies in Development. Summary Report. From a Workshop Conducted by the AAAS for the U.S. Department of State, as a Contribution to U.S. Preparations for the U.N. Conference on Science and Technology for Development. May 21 - 22, 1979, Washington, D.C., Jeannette Wedel, ed., pp. 1 - 47.

THE ROLE OF SCIENTIFIC & ENGINEERING SOCIETIES IN DEVELOPMENT

SUMMARY REPORT

From a Workshop conducted by the American Association for the Advancement of Science for the U.S. Department of State, as a contribution to U.S. preparations for the United Nations Conference on Science and Technology for Development.

May 21-22, 1979
Washington, D.C.

Jeannette Wedel
Editor

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CRS-290

THOUGHTS AT THE AAAS WORKSHOP ON THE ROLE OF SCIENTIFIC AND ENGINEERING SOCIETIES IN DEVELOPMENT, Washington, D.C., May 21-22, 1979

After several arduous sessions
With the cream of the Professions,
Making up a little list
Of ways in which they might assist
Countries that are poor, but which
Have some ambitions to get rich
By mastering the mystery
Of Science and Technology;

I am distressed to find that Pie
Stays obstinately in the Sky,
And that the troubled world is viewed
From such a lofty altitude
That not much wrong comes into sight,
And likewise, not too much that's right.

For in the course of being wise
We tend too much to generalize
When truth, as Blake calls from the stars
Rests in Minute Particulars.

Yet this thought takes us on the road
To information overload,
And it's not uniformly good
To see the trees but not the wood.

It is not easy to get rid
Of doing what we always did
And yet we hope that something new
Emerges in the distant view;

A sense that when all's said and done
Both Science and the World are one.
And that the weakest human cry
Resounds for ever in the sky.

So we must keep up the pursuit
Of Truth, and Truth's surprising fruit,
In all our several professions --
And that's the fruit of all our sessions.

Kenneth E. Boulding

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INTRODUCTION

The Workshop on the "Role of Scientific and Engineering Societies in Development" was the last of a series of four workshops conducted by the American Association for the Advancement of Science (AAAS) in connection with the U.S. Department of State's preparations for United Nations Conference on Science and Technology for Development (UNCSTD). The two-day workshop, held May 21-22, 1979 at the Marvin Center, George Washington University, Washington, D.C. involved sixty representatives from scientific and technical societies, academia, industry and government.

After an initial plenary session, the participants broke up into four working groups to discuss the unique capabilities that scientific and engineering societies can offer in:

- assistance in identifying R&D needs of a country.
- exchanging scientific and technological information.
- scientific and technological education and training.
- technology evaluation.

Each group identified specific roles for societies in each of these areas, which were then presented and discussed by four area caucuses - Africa, Asia, Latin America and Middle East - for specific application. The Workshop as a whole then reviewed each working group's findings.

The highlights of the discussions in each of these areas are summarized in the following pages.

In addition four resource papers were prepared for the Workshop as background information:

1. "An Inventory of Current Activities of Scientific and Engineering Societies in Developing Countries," Donald Marlowe, Executive Director, American Society of Engineering Education.
2. "Transferring Publicly Available Technology - The American Chemical Society's Approach," Robert W. Parry, Distinguished Professor of Chemistry, University of Utah and Gordon Bixler, Manager, Office of International Activities, American Chemical Society.
3. "The Global Network of Engineering Education Societies: Their Roles in Development of Technological Infrastructures," Merton R. Barry, Director, International Engineering Programs, University of Wisconsin.
4. "The Role of Scientific and Engineering Societies in Development," Donald G. Fink, Director Emeritus, Institute of Electrical and Electronics Engineers.

The papers mentioned above are included in the full proceedings report which has been prepared. Limited copies are available from the AAAS Office of International Science.

SUMMARY

The dominant focus of the Workshop and the resource papers was identification of the basic characteristics of scientific and technical societies that enable them to make significant contributions to the development process of any country. Specifically:

- they constitute a reservoir of individual scientists engineers and technicians with specialized knowledge and expertise that can be mobilized to undertake specific tasks;
- they provide a peer review system for evaluating the importance and value of scientific and engineering proposals, projects and accomplishments;
- they provide an open market of planning and delivery systems for technology, not constrained by institutional or proprietary or political barriers;
- they provide a useful teaching and educational function through the journals, reviews, handbooks, and books they publish on accomplishments and advances in their disciplines;
- they provide a forum for information exchanges on a wide range of topics in the scientific community.

The needs of the developing countries vary widely because of the different levels of scientific and technological development in each country. Therefore, each country must identify its own needs and set its own priorities. Scientists from developed countries can only attempt to translate their knowledge based on experiences in their own environments.

In order to transfer this experience, it is essential that United States societies form a partnership with developing country scientists in any development effort. While the ideal situation would be to establish linkages with an equivalent society, flexibility is required in selecting a cooperating unit abroad. It may consist of a college or department within a university, a research or training institute, a governmental unit, or an informal network of scientists and technologists, from which a society may develop later.

Another focus was the management and transfer of scientific and technological information to developing countries and its essential role in the development process. A basic function of scientific and technical societies is to collect technical information, and condense and focus this information for transmission to appropriate audiences. United States societies can assist in information exchange by:

- publishing the results of the research and/or teaching experiences of their memberships;
- conducting meeetings at which the results of recent studies and new ideas are exchanged both in lecture-type presentations and in person-to-person dialogues, and
- sponsoring workshops or short courses or topics currently amenable to solutions or ones in need of further study.

A guiding principle of the technical societies in the United States is that the exchange of information between two parties at least doubles its utility. This should also be the principle in the exchange of information between United States societies and technical entities (societies, institutions, or individuals) in developing countries.

A strong indigenous system of scientific and technological education is essential to the progress of a developing country. United States societies can assist in this development by:

- assisting in the formation and growth of indigenous scientific and technical societies;
- developing relationships with universities to give leadership in their disciplines towards more relevant training for foreign students;
- giving honor and prestige to professional participation in international development.

The United States scientific and engineering societies have served a useful function in the development process of this country, and can serve as models in developing countries. There are many diverse, but related aspects in development which impinge upon the role of technical societies. A high degree of tenacity and patience by scientific and engineering societies in developed countries will be required in their mission to assist in creating indigenous self-generated systems in developing countries.

I. ASSISTANCE IN THE IDENTIFICATION OF R&D NEEDS OF A DEVELOPING COUNTRY

In opening the discussion, it was noted that the great preponderance of Research and Development (R&D) competence is in the developed countries, whereas there is a great need for such competence in the developing countries. Further, most of this competence is in the private sector in the developed countries, but under the government sector in the developing countries.

Moreover the needs of developing countries vary widely because of the vast differences in the state of science and engineering development in the countries which compose the developing world. Also, each country has differing publics for R&D. Thus, the R&D needs differ among 1) the advanced researcher in the university or corporation, 2) the research worker in the specific development agency, e.g. a health planner in a local hospital or clinic, or an agriculturist in a field institute, 3) the policy maker in government, and 4) the teacher/trainer in the school, institute, or college. Sometimes, a single individual fills all of these roles. Yet, the research and development needs of each is very different and the responses of the U.S. technical society should likewise be differentiated. It is important that each developing nation identify its own problems (with outside assistance where appropriate) and set its own priorities.

The discussion of the role of the technical societies in the application of research and development to the problems of developing countries covered three general areas

(A) general factors germane to the involvement of scientific and technical societies in the R&D aspects of national development;

(B) the unique activities of societies with respect to R&D;

(C) the appropriate role of societies.

A. General Factors

First among the general factors, and certainly one of the more important, is the level of technological development within the developing country. The reason is that there must be within the country a body with the qualified technical capacity to function as a counterpart to the U.S. society. Without some suitably qualified group with which to interact it is unlikely much of a lasting impact could be accomplished. The body might be a professional group or society indigenous to the country, or it may be a college or department within a university, a research or training institute, a governmental unit, or an informal network of scientists and technologists.

A second general factor is the range of relevant R&D, whether oriented toward basic science, engineering or appropriate technology, complex or simple as the case may be.

A third general factor is the type of problem. Is it one of interest to the developed countries as well as to the developing countries, such as remote sensing, or of interest only to the developing country.

A fourth general factor relates to the type of scientific or engineering discipline, whether a well established, focused discipline or an inter-disciplinary area of study or research. There was some feeling that societies are best able to impact focused problems correlating closely with their particular discipline or concern.

B. Activities of Scientific and Technical Societies

The following activities were identified as unique to societies, so far as R&D is concerned:

(1) publications;

(2) the giving of advice on planning, policy and operations in the areas of society expertise;

(3) evaluation and peer review of proposals for or accomplishments from specific research or development projects;

(4) the conduct of specific projects or programs involving studies, or professional services, and

(5) assistance in the development of new subgroups or societies based on the growth of technology.

There was a consensus that technical societies do not, as societies, effectively conduct research and development. Their members do, but the societies do not. However, it was agreed that a society could identify, from among its members, a number who are well qualified in a particular field in which a problem has been identified. That group, working with a counterpart group within the country, could plan an R&D program to attack the problem, but then the actual pursuit of the R&D would be placed in other hands, perhaps a group of scientists and engineers from

within the country. The group selected by the U.S. society would not generally engage in the research. If asked, they might be involved in periodic reviews and progress evaluations.

From the discussions four general recommendations emerged.

- First, societies can serve as intermediary agents in many R&D situations for developing countries.

In some cases this is because there can be difficulties in dealing at the level of government to government, perhaps too much red tape on one side or mistrust of motives on the other. When much of the technology is in the hands of the private sector, the developing country may be suspicious of the motives of the private firm; so a professional society, as the funnel for the transfer, might be more acceptable. Finally, the society might be the desirable point of contact because it usually enjoys some measures of respect and recognition.

- The second recommendation is that societies can stimulate the formation of scientific and technical societies within the developing country when none exist, or
- act as a catalyst in the broadening of professional society roles to encompass consideration of R&D needs of the country.

The important element is to stimulate the emergence of a problem identification capability in the country.

One example was cited by the American Statistical Association which was asked to advise on the organization of societies in Mexico and Chile. As a result of an interchange series of visits, the scientists of

Argentina, Chile, Columbia, Mexico and Venezuela also organized their own Committee: "The Latin American Committee to Promote International Relations in Statistics" which will promote the development of statistics throughout Latin America and the relations between national societies as they are being developed in Latin America.

- it was recommended that societies should continue, when appropriate or natural opportunities arise, to enter into cooperative bilateral or regional programs such as that reported by the American Chemical Society (ACS) for its Egyptian activity.

ACS working with the Egyptian Academy of Scientific Research and Technology conducted a week-long workshop on industrial chemistry in Cairo. Americans and Egyptians met to exchange publicly available technology in five chemical subject areas that constitute serious economic problems for Egypt. The workshop contributed significantly to Egypt's ability to overcome the problems and laid the groundwork for a number of joint research projects that can benefit both nations. Currently, two of these projects have been selected for implementation by the Agency for International Development.

C. Role of Scientific and Technical Societies

One question posed was how developing countries could be more aware of the interests and capabilities of societies in the U.S. The problem was described as one of marketing.

- It was suggested that a "broker" function is needed in the same manner that Volunteers in Technical Assistance (VITA) brokers the expertise of volunteer individuals to developing countries.

An organization such as AAAS or some other new or existing group could broker the talents of professional societies. This could be regionalized or focused by groups or disciplines.

The questions of the role which professional societies might play in bringing to the attention of developing countries publicly available technology, and how to redistribute equitably the level of R&D among countries were considered, but not responded to with any viable recommendations. Similarly the following topics were discussed again with no clear conclusions:

1. Is there a role for the social sciences in evaluating, or forecasting, the social impacts of a proposed development program on the society into which it is to be introduced? Would the developing country be in a better position to judge whether to proceed with such a development with such a social impact study?
2. A primary objective of cooperative programs involving R&D should be to present a challenge to the scientists of the developed countries, as well as an opportunity for the scientists of the developing country. There should be a two-way flow of information.
3. Scientific and technical societies usually do not like to be identified with failure. Since development programs inherently contain a risk factor, are societies prepared to face the possibility of failure in cooperative development programs with developing countries? Further, some-

times it is not known for a long period of time whether a program has been successful. Can better evaluative techniques be introduced?

II. EXCHANGE OF SCIENTIFIC AND TECHNOLOGICAL INFORMATION

The role of societies in the transfer to developing countries of scientific and technological information should stress the exchange of technological information rather than a one-way flow; there should be exchange of information rather than a designated donor and a designated receiver. The exchange of information between two parties at least doubles its utility. That is the guiding principle of the technical societies in the United States as they promote dissemination of new knowledge in their journals and meetings; it should also be the guiding principle in the exchange of information between technical societies in the United States and technical entities (societies, institutions, or individuals) in developing countries.

It is necessary to realize that everything cannot be accomplished at once. A program of international technology transfer must determine needs and priorities, do first things first, and not spread itself too thinly.

There are great inequalities in the distribution of scientific and technological information between regions, or countries, or even within countries. A major priority should be efforts to reduce the inequality of access to this information, and the inequality of skills in its management and use.

The discussion of the role of U.S. societies in this information exchange centered on three areas:

(A) first, in what ways can U.S. technical societies participate in the exchange of technical information with developing countries?

(B) how can U.S. technical societies best make use of the absolutely essential face-to-face contacts that are generally recognized as the most effective mode of technology transfer?

(C) what can U.S. technical societies do to focus or concentrate useful information, reducing its volume, improving its relevance, and relating categories of refined, concentrated information to categories of users?

A. Ways Scientific and Engineering Societies can Assist in Information Exchange.

1. Most societies publish the results of the research and/or teaching experiences of the membership. Usually these are in the form of journals, review articles, and handbooks, or in some cases textbooks and training manuals.

2. Annual, topical, and other meetings are held by national societies and local chapters or branch societies at which the results of recent studies and new ideas are exchanged both in lecture-type presentations and in person-to-person dialogues.

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3. Societies sponsor workshops or short courses usually on topics currently amenable to solutions or ones where progress has been slow but needs encouragement.

4. Societies maintain directories, distribute newsletters, and attempt to alert their membership on happenings of interest both on national and international scales.

B. Ways U.S. Technical Societies Can Make Best Use of Face-to-Face Contacts as the Most Effective Modes of Technology Transfer.

1. In many ways, U.S. technical societies can facilitate face-to-face contacts for the exchange of technical information. Examples include students abroad, foreign attendees at U.S. conferences, the reverse use of foreign students as information filters, and encouragement of both national and regional groupings of technical societies in developing countries.

2. Technical Society Programs. There are many useful examples of face-to-face contact possibilities where U.S. technical societies could assist: faciliate foreign tours of U.S. technologists; fund foreign participation in U.S. technical society meetings and committee activities, including editorial activities; form international committees of national technical societies to formulate programs abroad; assist in the organization and management of technical societies abroad; establish foreign divisions, sections, local chapters, and foreign associate memberships in U.S. technical societies; help foreign technical

societies to prepare proposals for funding of projects; develop joint bilateral research programs or projects (non-governmental); assist local (foreign) writing of handbooks and review articles; and encourage foreign students in the United States to study problems relevant upon their return home.

3. Dissemination of Information about Opportunities for Foreign Students in the United States. Examples include: Preparation of inventories of foreign technical societies, funded travel of staffs of U.S. technical societies, maintenance of contacts with returnees trained in the United States, and orientation programs to facilitate the entry of foreign students to the U.S. educational complex.

C. Condensing and Focusing Information by Categories through Technical Societies; Identifying Kinds of Knowledge Appropriate to User Groups.

With the very large volume of technical information now available, it was agreed that condensing and focusing such information would be of tremendous aid to developing countries. Reviews, handbooks and textbooks represent some of the more effective ways for achieving this goal. To the extent that technical societies can promote preparation of such material, they will assist in information transfer to developing countries.

It was agreed that a variety of audiences must be reached through information transfer activities and that different methods of information transfer are appropriate for different groups. The groups, their location, and the access modes are summarized in tabular form:

	Group	Location	Needs	Strengths
1)	Advanced Research Groups	University campuses, some corporations	Full range professional journals, ultimately electronic access to data bases	High level expertise voluntary service
2)	Development Workers	Ministries, local government	Pragmatic information on solving problems	Knowledge of local problems and how technology impacts them
3)	Policy Makers	Mid- to Upper-Government Level	Summaries, evaluations, case studies, Largely in print now, but cassettes may become useful if properly prepared	Knowledge of local problems, strengths and attitudes
4)	Teachers	High schools colleges, universities	Textbooks, review articles, summaries and then primary information if possible	Close contact with problems and culture

Of the above, Item 3, policy makers, has received the least attention, but some activity in this sphere has been initiated by a group known as AISLE (An InterSociety Liaison Effort). This voluntary organization is a multi-disciplinary, balanced group of scientists and engineers of all types that meets with legislators, policy makers and public administrators in an effort to make better use of scientific and engineering information in policy formuation. It has a good record so far in the U.S. and might

be expanded to the international scene. Other groups also have formal programs for transferring scientific information to local policy makers. International expansion has yet to be demonstrated.

Some of the older, more conventional modes of presenting information remain appropriate for many if not all groups. The most modern, "high technology" forms of information transfer may be needed by the most advanced research groups, but become less appropriate for groups further down in the table. Even many newly formed and developing research groups may profit initially by use of hard copy materials rather than the more sophisticated means of information transfer.

It was suggested that a serious problem remains in the area of book and journal distribution. Intervention of technical societies to push for help in this problem was recommended. Regulatory agencies and funding agencies may well be approached through group action.

The three words that stress the essence of the discussion are:

First, exchange; second, contacts; and third, relevance.

United States societies have a useful role to play in all three items. Further detailed suggestions follow in this same format.

Technical Information Exchange.

1. There should be a filter to assure that investment in the flow of information from one country to another should not be wasted on information of low value or obsolete content.
2. There should be purposeful use of U.S. societies' journals to further international exchange of scientific and technological information. Possibilities include:
    a) Providing space in these publications for news of foreign activities and of non-U.S. members

b) Discussion of global interests

c) Educational information services available to non-U.S. members

d) Publicizing urgent needs for technical information or expertise for developing countries.

e) Reporting activities of U.S. technical societies abroad (accomplishments which include both successes and failures)

f) Assisting foreign authors in preparation of manuscripts for publication in U.S. journals

g) Listing of U.S. and foreign job opportunities

3. U.S. technical societies should promote and assist in the writing of technical review articles and handbooks of particular value to technologists and teachers in developing countries. (However, it is recognized that the primary responsibility for such efforts lies within the countries themselves.)

4. Explore the use of sound and audio-visual cassettes (preferably in languages indigenous to the developing countries) to transmit scientific and technological information to cultural centers abroad to enable foreign technical audiences to have increased access to complex technical information.

5. Technical societies might investigate or stimulate investigation of the following barriers to international information/exchange followed by the formulation and implementation of programs to overcome them.

a) Postal charges

b) Patent and copyright restrictions

c) Problems in shipment of heavy educational materials

d) Identification and meeting of needs for broken and open sets of serials

6. U.S. technical societies should encourage the creation and maintenance of regional, international, and interdisciplinary technical journals.

Face-to-Face Contact with Developing Country Technical Personnel.

1. To facilitate face-to-face contacts between U.S. and developing country technical society members, it would be useful to have an inventory of their societies, identifying the names and addresses of their permanent staff members and leading personalities.

2. Foreign travel of staff and representatives of U.S. technical societies should be encouraged, especially in response to requests originating in developing countries.

3. Periodic conferences should be held in the United States and other highly industrialized nations to provide specific consideration to problems and interests of developing countries to which their representatives would be invited and given special opportunity to present papers.

4. Meetings of groups in workshops, including U.S. and developing country participants representing technical interests, economists, educators, administrators, and legislators could be useful to study issues of public interest science.

5. Members of U.S. technical societies with foreign languages skills and acquaintance with foreign culture patterns should be encouraged to employ these special skills in furthering foreign contacts with that part of the U.S. technical community they belong to. Of special importance are those scientists and engineers who are now U.S. citizens but who have family ties and language skills due to their origins in the developing countries. A directory of such persons should be prepared.

6. Liaison arrangements among technical societies in different countries should be established and supported and their activities publicized.

Information Processing for Conciseness and Relevance.

1. Conciseness.

The particular form in which information is transmitted to a given country depends upon the technical level of that country's information system. Information should be made available to U.S. technical societies on a country-by-country basis as to the level at which information should be packaged.

2. Relevance.

a) To a considerable extent the shape, form and priorities of the needed information transfer are determined by the user. In the developing countries, users may be assisted in determining what these criteria are, and how to apply them to incoming U.S. information.

b) Improvization is regarded as an important activity in adapting technology to the needs of a particular region or developing country. The multinational corporations need to be assisted in the effort to enable technological product modifications to meet specific needs. Technical societies may be able to help in this effort.

c) Technical societies should be prepared to provide advice to developing countries as to the appropriateness of the transfer of hazardous technology--whether in the form of industrial facilities, raw materials, products or process information.

d) Opportunities should be sought (and efforts supported) by U.S. technical societies to hold conferences in developing countries to address subjects of particular interest to the country in question.

e) While it is recognized that the impacts of applied scientific and technological information are seldom politically neutral, it would be inappropriate for U.S. technical societies to attempt to screen the outflow of information from the United States on the basis of criteria of political consequences. However, there may occur situations in which ethical restraints on information flow are obvious and appropriate (e.g. the flow of information about the production and use of dangerous drugs).

f) Whenever the opportunity arises, U.S. technical societies should make use of, and attempt to strengthen, such indigenous institutions in developing countries as libraries, archives, data repositories, universities, schools, information management systems, and local technical societies and groups.

III. SCIENTIFIC AND TECHNOLOGICAL EDUCATION AND TRAINING

The development of a strong indigenous system of scientific and technological education is essential to the progress of a developing nation. This is no small task. Looking at the experience of the Western European and North American countries, it can be argued that the task requires a century for its accomplishment. Since the goal is clear, the question before us may be stated thus: "What contribution can the scientific and engineering societies in the developed countries make towards the more rapid development of a system of scientific and technological education in the developing countries?"

This issue has been on the agenda of the U.S. societies for the last quarter century, and much good work is in progress, some is continuing and some remains to be begun. The experience of the past and suggestions for the future have been recorded in such publications as:

"The Role of U.S. Engineering Schools in Development Assistance" - National Research Council - 1976

"Educating Engineers for World Development" - American Society for Engineering Education - 1975

"Science Development - The Building of Science in Less Developed Countries" - PASITAM PRESS - 1976

"Paradisia and Dominatia: Science and the Developing World," Foreign Affairs 53, 699 - 1975

Nevertheless, development assistance has not been either a major element or a high priority item on the agendas of the major U.S. technical societies. What has been accomplished has usually stemmed from the inspired efforts of a few leaders who sensed the importance of the issue.

The discussion of elements feasible for developing a strong indigenous system of scientific and technological education in a developing country covered these main areas:

(A) importance of indigenous scientific and technical societies,

(B) relationships with universities,

(C) prestige in international relations, and

(D) the "brain drain."

A. Importance of Indigenous Scientific and Technical Societies

It was concluded that the presence of indigenous apolitical scientific and engineering societies is an important, if not essential, component of the development process:

- as an indication of the essential cohesiveness of the scientific and engineering society, as demonstrated by the commitment to disinterested public service inherent in such an organization;
- as a vehicle for promoting an enhanced social status, in his own society, for the scientist, engineer and technician. This status is essential to the engagement of an appropriate fraction of bright young people in these professions;
- as an agent for setting professional standards;

- as a convenor of continuing education for the professionals.

National academies alone cannot perform these functions. The academies and societies have complementary roles to play, providing necessary points of linkage between elites and between professionals active in current technologies.

A number of difficulties were noted in this concept. Technical societies in the developed countries are apt to be more divided into technical specializations than those in the developing countries, making direct linkages more difficult. Also, in cultures where the family and tribal influences are strong, organization of national structures may be difficult. Scientific institutes, research councils, and similar entities may be the central reference points for indigenous professionals and may be the appropriate linkage points for U.S. societies.

B. Relationships with Universities

United States universities currently provide higher education for nearly 250,000 foreign students each year, about 80% of whom are self, family or country-of-origin supported. There are many areas in which society to university relationships can make a great contribution to international development.

1. The societies can contribute to the establishment of programs to improve the selection of students from developing countries to be educated in the technically advanced countries. A prototype program of this type is working in the field of physics.
2. Societies could improve their services to their foreign student members. Currently, there is little effort to develop programs of particular interest to the foreign student.

3. Societies could organize joint efforts among universities, governments and industries to provide more relevant programs of graduate study for foreign students.[1)] There seems to be general agreement that little change is required in undergraduate programs, but that more could be done to orient the student to resources available in the U.S. concerning their own countries, and to focus their graduate studies on problems relevant to their own country's needs and problems. Such students would then be encouraged to produce development-oriented theses and dissertations within the contraints of disciplinary topics and academic excellence. Cultural identification is essential.

4. Societies, working with universities, can organize lecture series, summer seminars, and forums for foreign students or scholars on the role of the scientist and engineer in those policy-making positions which involve relations between science, technology and development. There could also be refreshers for engineers and scientists who have been engaged in policy-making for a period of time and would benefit from exposure to scientific and engineering courses at the cutting edge of their disciplines.

5. Societies could provide U.S. universities with scientific and technical personnel experienced in working abroad, as a source of information on the languages, cultures and traditions as well as the political and social sensitivities of the countries from which the student body is drawn.

6. U.S. societies have much experience in the matter of continuing education for engineers. The American Society for Engineering Education recently convened the first international symposium on continuing education at the Autonomous University of Mexico, April 1979, and the Association for Media Based Continuing Education for Engineers has initiated a program of providing videotaped lectures to foreign engineers through their local universities. Imaginative programs of this type should be extended. Societies should experiment with use of satellite communications.

7. Societies and universities should encourage programs which contribute to scientific and technological literacy of the public in developing countries. The Singapore Science Center, for example, circulates a journal of middle level technical information to 20,000 readers, and Korea is placing high priority on the implementation of programs for the better public understanding of science.

8. There should be opportunities for foreign graduate students to intern with U.S. media (newspapers, book publishers, TV and radio stations, etc.), perhaps following the model of the very successful AAAS Mass Media Science Fellowship Program. Other societies with their massive publication programs, could organize such experiences.

9. Societies should be of particular service and value to teachers of science and technology in developing countries. Investigation of the opportunities for service here should be undertaken by the

U.S. societies and federal agencies.

10. U.S. societies can develop orientation courses for incoming foreign graduate students to provide them with a) English language training, b) remedial statistics and methodological training, c) orientation to the requirements and theoretical orientations of the discipline in the U.S., d) resources for completing research on their home area problems that are available in the data and library archives in the U.S., and e) special workshops on R&D resources and techniques available in the United States. An example is the Economics Institute offered each summer by the American Economic Association in Boulder, Colorado; the American Sociological Association is developing a similar program.

C. Prestige in International Relations

There are several problems in the area of "prestige" which impede the contributions which U.S. scientists and engineers may make to foreign development, or which are internal to the developing country. Scientific and engineering societies, because of the tremendous leverage for peer approval which they exercise, can play a major role in alleviating these problems.

1. The reward structure of the U.S. academic community does not give adequate recognition to interest and participation in the development process. Promotion and tenure policies of U.S. universities do not provide incentives (in fact, they provide disincentives) to participation by young faculty. This is almost equally true of the professional community. Societies much confront this problem, and with universities, modify the incentive system to encourage greater participation. The disruptive effect to established career patterns

of periods of foreign service must be minimized. Professional societies, by honoring service in the cause of development, can provide critical peer recognition needed to assure wider participation and support.

2. Developing countries can make better use of their scientists and engineers who have been educated abroad as resource persons for U.S. societies trying to define and analyze problems in development.

3. Foreign students in the U.S. sometimes are unable to secure maximum advantage from their educational programs because of a reluctance on the part of their peers to recognize the contribution of practical experience to advances in science and technology. The lack of prestige for "hands on" experience in their own cultures leads to excessive reliance on theoretical work. U.S. and foreign societies should strive to raise the prestige of applied scientific investigations in their own cultures, if the development process is to succeed. The societies should draw industry into this, and society-industry-university seminars on this topic could be organized for new students entering the U.S. educational system.

4. The recognition and prestige of regional organizations for scientific and technological cooperation must be raised, even at the expense of the world organizations. At least in engineering, experience indicates that the regional organizations are the most effective, being better equipped to recognize and solve problems arising from language and cultural differences, which become intractable in a world-wide organization. The existence of global

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organizations must not be permitted to denigrate the regional federations.

It was agreed that the proposed Institute for Scientific and Technological Cooperation should use the U.S. technical societies as a principal channel for assisting societies and universities in developing countries in securing for them:

(a) Access to U.S. literature by supporting programs designed to make U.S. technical literature available in countries where foreign exchange in lacking. (At one time the State Department supplied differential foreign exchange to provide U.S. non-technical literature abroad.) Both research literature and engineering practice-oriented journals are necessary.

(b) Continuation, for five or ten years, of membership in U.S. societies, after students return to their homeland after studying in the U.S.

(c) Services which complement the educational process in the U.S., such as methods of: 1) accreditation of curricula, 2) linking practical training with technical education, 3) providing interdisciplinary seminars, 4) assisting the orientation of new students in the U.S. higher education system, and 5) preparing graduates for reentry to their own cultures.

(d) Information on developments in secondary school pre-science education, such as the Physical Science Study Comittee and Biological Sciences Curriculum Study curricula in the U.S.

(e) Access, at reasonable rates, to invitations for foreign students to attend meetings of science and technical societies in the U.S.

The American Association for the Advancement of Science and the American Political Science Association now do this. (Agency for International Development and International Communication Agency contracts used to support this concept.)

(f) The services of U.S. societies as convenors of technical colloquia. The U.S. societies have highly developed peer review systems for selecting the real experts on any technical topic.

(g) Access to the best U.S. thinking on manpower supply and demand. The linking of the planning for national productivity with the scientific and technical manpower requirements is a difficult but necessary task.

(h) Assistance in the development of the technical infrastructure at the secondary school level, equivalent to the interests of young U.S. persons with hobbies such as ham radio operators, model airplane builders, home garage mechanics, etc.

(i) Support for a visitors registry, matching the availability of U.S. scientists travelling abroad with departments, laboratories or societies abroad which would welcome person-to-person contact with U.S. experts. A similar registry might be developed for foreign persons visiting the U.S.A. There should be an international common market in technically educated persons.

D. <u>The "Brain Drain"</u>

Agreement on the causes, consequences and responsibility for the so-called "brain drain" was not reached. However, <u>it was agreed that the best response of the societies was for them to pursue rigorously the improvement of the social conditions and status of the engineer and scientist in their</u>

own countries. Technical societies should encourage discussion of the appropriate use of indigenous and expatriate manpower (and womanpower) in the development process. The societies should give leadership to efforts toward identification of the contributions of technologists in various areas, and to provision of information to foreign graduate students about opportunities in their home country or region. A registry of information on scientific and technical opportunities available in foreign areas could be important.

In addition, the societies could assist in recruitment of teaching personnel for foreign institutions, including not only professors, but those experienced in laboratory organization, instrument maintenance, equipment, construction, and technical reporting.

Finally, it was agreed that the interdependence of the modern world calls for the existence of a highly mobile, highly intelligent class of technical personnel who will serve as an international corps, to be available wherever the world development process has the greatest need. In such a situation, the competitive concept of a "brain drain" would become obsolete. Further research on the international mobility of technical personnel is badly needed.

IV. TECHNOLOGY EVALUATION

In discussing the role of scientific and engineering societies in technology evaluation, there was immediate consensus that the societies can play an effective role in technology evaluation for the special needs of the developing countries. This is possible in view of the considerable expertise of the members of the societies, their sources of information drawn from the experience of the societies in technology evaluation for their own countries, and their ability to easily and quickly identify the sources of technology as well as their capability to assemble teams of experts for specified programs. It then remains to identify the manner in which the professional societies can undertake functions of technology evaluation for developing countries and the mechanisms that could facilitate such functions. It was considered not feasible to identify all possible technologies for developing countries. On the other hand, it was decided to indicate the processes by which a technology evaluation can be undertaken in an effective and efficient manner.

The discussion of the role of societies on technology evaluation covered these areas:

(A) basic considerations,

(B) nature of processes,

(C) mechanisms, and

(D) impediments.

A. Basic Considerations

The fundamental consideration in the involvement of the professional societies in technology evaluation for developing countries is in effect to enhance the indigenous capability of the professionals in the developing countries for better technological evaluation in accordance with the needs of their societies. The professional societies of developed countries can only attempt to translate the experience acquired in their own environment for adaptation in developing countries.

B. Nature of Processes

The technical societies in developed countries have over the years undertaken a range of activities in technology evaluation in the context of their own countries. The group listed examples of such activities as follows:

1. Location and supply of individual scientists with special knowledge and expertise. Professional society headquarters staff are experienced in this function and able to make specific referrals.
2. Provide ad hoc searches for technological options through appointment of expert task forces and committees. Such expert groups can investigate technological options in depth and produce helpful position papers.
3. Cooperate in cost/benefit studies, as in 2. above, through identification of and collaboration with recognized experts.
4. On request provide state-of-the-art opinions derived as in 2 above.
5. Collect and utilize experiences gained in applications of technology in developing countries. Useful information derived from firsthand experience can be transmitted to both developing and

developed countries.

6. Participate in the early stages of determination of need for particular technologies in developing countries, so as to add credibility and strengthen confidence in choices made.

7. Moderate over-expectations with respect to technological or economic benefits to be derived from application of new technologies.

8. Assist the proposed U.S. Institute for Scientific and Technological Cooperation (ISTC) now being formulated through the U.S. Congressional process.

9. Serve as mediators between developing countries and U.S. labor or industry. Because U.S. labor and industry recognize possible risks through cooperation with developing countries, there is need for sound scientific counseling. American labor and industry must be shown that job security and product markets can be improved by investment in cooperative projects with developing countries. Under proper surveillance, such projects can be mutually beneficial.

10. Technical societies, by definition, carry out a useful teaching and educational function for the general public. Published scientific information and information presented at scientific meetings benefit the public and can be transferred to developing countries.

11. Assist in establishing professional societies in developing countries. U.S. technical societies can serve as models in this regard. Because they have served a useful function in the U.S., it is likely that they would be useful to scientists and citizens in developing countries.

12. Assess future technological directions. By virtue of familiarity with new scientific developments, such trends can often be best recognized from the professional society vantage point.

13. Focus interdisciplinary insights and opportunities--again, by virtue of unique perspectives. Volunteers of staff can often apply knowledge born of experience to the solution of interdisciplinary or multidisciplinary problems.

14. Facilitate informal communication and circulation. Members of professional societies communicate within an informal network of telephonic and written communication. New ideas can thus be communicated rapidly and have served to advance the state of art in all scientific disciplines.

15. Provide an open market of planning and delivery systems, not constrained by institutional or proprietary barriers. Such systems are not usually accessible without the help and intervention of scientific societies.

16. Social science organizations can help resolve the motivation and cultural problems related to technological choices and potential consequences. They will have the behavorial and social insights to help materially in making technological evaluations and technology transfers effective.

It was recognized that this list was not comprehensive by any means nor was it given in any order of priorities. Many of the technical societies in developed countries would like to be involved in most of the above activities, some in a limited number of them and some in none at all. However, it was agreed that given the proper environment, modification and

encouragement, many of the technical societies in developing countries would be able to achieve an extension of these processes to the benefit of their countries.

C. Mechanisms

In order to encourage the technical societies in this type of a mission, several approaches were suggested. There was agreement that each of the interested technical societies should explicitly include in its mandates a statement of desire for involvement in assisting the developing countries in better technological evaluation. Technical societies must take the initiative and demonstrate a commitment. The role of technical societies in aiding developing countries could be supplemented and augmented by government agencies. In particular, funding for these initiatives, if they are to be of a scale large enough to be of any practical consequence, must come from governmental organizations, those in the developed countries and international organizations.

Technical societies can show this commitment in various ways:

(1) By publishing international journals, or

(2) By organizing international congresses, symposia or colloquia.

Publications

In the case of publications, it is often economically advantageous for a given U.S. professional society and a group of overseas societies to collaborate in a publication venture. A case in point is the International Journal of Systematic Bacteriology, published by the American Society for Microbiology with the help of the International Association of Microbiological Societies. The Optical Soci-

ety of America, for example, published an English translation of the Soviet Journal of Optical Technology, as well as the Russian language Optics and Spectroscopy. Numerous other professional societies have published translations of books authored by Western or Eastern Europeans, and Latin Americans. In such mutual endeavors, professional societies can find a healthy mixture of altruism and self-interest and public service and profit.

Interciencia is a trilingual journal of science and technology for development published by the Interciencia Association, a federation of eight associations for the advancement of science in the Western Hemisphere.

International Meetings

The United Nations Conference on Science and Technology for Development is itself an example of an international meeting for exchange of information within a defined subject area. Numerous other international congresses, symposia and colloquia have taken place for disciplinary scientific exchange, and some of these have been of special value to developing countries. An example is the Vth International Conference on Global Impact of Applied Microbiology (GIAM V) held in Bangkok, Thailand in November, 1977.

A constituent part of GIAM V was a Symposium on Indigenous Fermented Foods. This symposium was noteworthy for bringing scientists from developing countries into contact and communication on the compelling international questions of food, nutrition and hunger. Information was exchanged on nutritious and inexpensive foods of value to populations of lower economic status in developing countries. Pro-

fessional societies are equipped to organize meetings of this sort for the benefit of international science.

Because disease agents do not recognize or respect geographic boundaries, much medical attention has been given to problems of international health. The World Health Organization has helped in the control of major diseases on worldwide scale. Because of one WHO program, it is now possible that smallpox has been eliminated from all parts of the globe. Professional societies have cooperated with WHO in this effort and have contributed substantially to the encouraging results.

In the summer of 1978 a tissue culture conference was conducted in Nairobi, Kenya with the assistance of WHO and the Food and Agriculture Organization (FAO) of the United Nations. The conference, held at the International Laboratory for Research on Animal Diseases, was unique in providing both information and training for scientists of developing nations.

In August 1977 a Seminar on Desertification was conducted in Nairobi, Kenya cosponsored by AAAS, the Association Francaise pour l'Avancement des Sciences, the British Association for the Advancement of Science, the East African Academy, the Indian Science Congress, and Interciencia Association. This international scientific seminar, convened immediately preceding the U. N. Conference on Desertification, reached agreement on a set of critical indicators crucial to monitoring and evaluating desertification. Currently the chosen indicators are being tested and validated at four development sites in India, Iran (the working party report is completed, further

work is pending), Mexico and the United States.

In October 1978 the Asian Regional Seminar on the Contributions of Science and Technology for Development was held in New Delhi. This seminar, conducted by AAAS, the Indian National Science Academy, and the Indian Science Congress Association, provided specific examples of new programs, projects and technologies; identified problems and priorities in applying science and technology; and made recommendations for government policy planners. It was a recognized non-governmental initiative relating to the August 1979 U. N. Conference on Science and Technology for Development.

The United Nations could help in providing an international directory of participating societies. It has been reported that the proposed Institute for Scientific and Technological Cooperation will have such information.

D. Impediments

The group briefly examined the nature of impediments that occur in the effective involvement of technical societies between developed and developing countries.

Firstly, the structure of obstacles such as postal rates, tax laws, tariffs, patents, trademarks, etc., were identified. The group felt that it should be possible to arrive at mechanisms that will reduce the effects of these structural obstacles. Secondly, there are social and political obstacles which will need longer-term solutions. Thirdly, there are cultural, linguistic, geographical and other obstacles which need to be recognized in evolving mechanisms for interaction among technical societies.

V. ASSISTANCE IN ESTABLISHING SCIENTIFIC AND ENGINEERING SOCIETIES IN DEVELOPING COUNTRIES

These societies by their very nature have a unique role in the development process of any country. Basically they can: (a) assess the appropriate use of the profession for the betterment of society, (b) serve as a vehicle through which individual members maintain and promote the integrity of the profession, (c) establish standards and ethics for the practice of the profession, and (d) provide continuing education for the professionals.

The United States' scientific and engineering societies have served a useful function in the development process of this country, and they can serve as a model for developing countries. It was the consensus of the group that U.S. societies should contribute to the development of indigenous scientific and engineering societies by having programs:

(a) Honoring distinguished colleagues from developing countries;

(b) Making research awards to individuals of developing countries;

(c) Conducting international seminars on the functioning of a technical society;

(d) Establishing and strengthening linkages between U.S. and comparable foreign societies;

(e) Welcoming foreign members from developing countries; adjusting dues requirements to account for shortages of foreign exchange;

(f) Supporting efforts of developing countries to produce translations or media-based materials in their own languages;

(g) Relating problems of developing countries to technical disciplines in developed countries through topical seminars, conducted both at home and abroad. The example of the American Chemical Society/ Egyptian National Research Center seminar is worthy of emulation, and is deemed to be very cost effective.

(h) Maintaining rosters of societies and society officers in developing countries. This could be done by some multidisciplinary society in the U.S., perhaps the American Association for the Advancement of Science. This could then be available as a resource for U.S. societies or individuals wishing to establish linkages abroad.

(i) Maintaining a roster of successful contributions by U.S. societies to the international development process, which successes could then be emulated by other U.S. and foreign societies in other disciplines.

(j) Providing internships and seminars to inform persons in the developing countries of the intricacies of society operations.

(k) Providing information on the processes of setting professional standards and furnishing continuing education to professionals.

Technical societies can often increase their impact and effectiveness if they band together in coalitions. Several such coalitions of scientific societies and of scientific and engineering societies now exist in the United States. One is known as the Council of Engineering and Scientific Society Executives; another is the Council of Scientific Society Presidents. Other collections of scientific organizations form so-called "umbrella" societies, such as the American Association for the Advancement

of Science, the American Institute of Biological Sciences, the Federation of American Societies for Experimental Biology, the American Institute of Physics, the American Institute of Chemists, the Federation of Materials Societies, etc.

The roles of scientific and technical societies in development are constrained by the following considerations: (a) how science is actually conducted in a given country, for example the nature of support and the roles of individuals and governments; and (b) the relationships between science and technology and the developmental needs, both economic and social. The diversity and interconnected aspects of these considerations will require a high degree of tenacity and patience by technical societies in developed countries in their mission to assist in creating an indigenous self-generated technological base in developing countries.

Appendix VIII. Synthesis of Commissioned Studies: The Ordering of Proposals for Possible Initiatives to be Offered at UNCSTD [Dealing Primarily With Intergovernmental Cooperative Science and Technology, Synthesized From Research Reports and Other Studies Prepared for the Coordinator's Office]. Prepared by the Department of State, 1979.

Source: The Ordering of Proposals for Possible U.S. Initiatives To Be Offered at UNCSTD, Prepared by the Department of State, March 15, 1979. 50 p.

THE ORDERING OF PROPOSALS FOR POSSIBLE U.S. INITIATIVES TO BE OFFERED AT UNCSTD

March 15, 1979

Department of State
Washington, D.C.

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INTRODUCTION

In preparing for the UN Conference on Science & Technology for Development scheduled to be held in Vienna in August, 1979 the U.S. Department of State, in collaboration with NSF and AID commissioned studies, sponsored workshops and solicited comments on subjects of relevance to the Conference Agenda topics, from U.S. Government agencies and from the U.S. private sector (academe and the business community). The reports flowing from these efforts, as well as several important current studies of relevance to the Agenda* were reviewed to identify the following kinds of information:

(1) What new programs (or initiatives) are proposed
(2) What changes in U.S. Government policy is recommended
(3) What changes in U.S. positions at international fora are recommended
(4) What important new information is offered
(5) What action is proposed that should be taken by the less developed countries
(6) What important points of view were expressed

This document sets forth a comprehensive ordering of the first category -- the proposals for initiatives. In some instances, these proposals conflict with established U.S. policy. In most of those instances, we have identified the policies that must be reconsidered if the proposal is to be adopted. Much will depend upon decisions taken in response to PRM-33.

In ordering these proposals, a number of difficulties presented themselves:

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* A listing of reports included in the T/CST preparations is attached as Annex I. A listing of papers and memoranda considered is attached as Annex II.

1. The idea of applying S & T for the development efforts of the LDC's is not a new one. The U.S. Government has been engaged in programs to support institution building in the LDC's for more than 30 years. There might be programs now being implemented by AID in certain LDC's, that are already doing things just now being proposed. Decisions taken at recent UN megaconferences (such as the 1974 World Food Conference) have generated new U.S. programs, or redirected the emphasis of ongoing programs that have already been approved for inclusion in Agency budgets for FY 1979 and FY 1980. While these might be U.S. initiatives in one sense, this exercise is an attempt to identify actions or activities that are not, at this time, approved and included in ongoing U.S. Government programs.

2. In preparing a comprehensive list of about 500 initiatives there is a conflict between brevity on the one hand and clarity and completeness on the other. We have leaned toward brevity. It is possible to retrace the steps of the ordering process for those proposals for which additional information is needed. The "ordering" of these proposals was designed to facilitate the evaluative process which is to follow. We recognize that individual proposals will not be looked at in terms of whether to accept or reject the proposal as summarized, but rather to determine whether the idea offers sufficient potential on which to design an initiative for the conference.

3. Some proposals seemed to be subsumed by others; some did not seem to justify separate mention; and some appeared in conflict with others. There is always the risk that somebody's proposal was inadvertantly omitted and that that proposal is precisely the one for which we are all searching. We have made an honest attempt to make a comprehensive ordering, and, on occasion have combined similar proposals to facilitate review and evaluation. If someone's proposal has slipped through our "comb," we apologize for that, in advance.

A few of the studies listed in Annex I have not reached us in final form as of this date. If these studies reveal new proposals for initiatives that have not been included in this "ordering", we will prepare a supplementary paper when all studies are complete.

PROPOSALS FOR INITIATIVES - INDUSTRY

A total of more than 60 proposals were made (some general, some very detailed and specific) to describe ways in which the U.S. Government could facilitate the utilization of the resources contained in the private sector for the benefit of LDCs development efforts. It will be remembered that the U.S. Government, as a matter of policy, has determined to limit its official development assistance to the area of basic human needs and to the least developed of the LDCs. Reconsideration of these limitations on official development assistance were urged by a number of studies; (for example, it was proposed that AID should recognize the needs for assistance to middle-income countries (see FMME #15, also see Nooter memo dated 11/77)). It was also recommended that AID should assist in support of institutional infrastructure development (see Cooper/Benson Memo #104) and that AID should assist the middle and poorer LDCs that have little to attract multinational corporations or possibly provide funding of initial contact between U.S. companies and these countries. There were also proposals urging continuation of the U.S. government-business dialogue, initiated under the UNCSTD preparation outreach program, (see IMDI #21) and that there should be greater participation by U.S. private sector in U.S. government policy formulation. (see DRI #5, FMME #15, and IMDI #21). In none of the studies or workshops was there objection to the U.S. Government attempting to involve the U.S. private manufacturing sector in the development programs to assist LDCs. (Behrman #119)

It was proposed that a greater effort be made to make imaginative use of the resources of the multinationals to optimize their affirmative contribution to LDC development efforts. This approach was contrasted against past efforts aimed at reducing the negative aspects of MNCs operations. It was believed that the private sector could be prevailed upon to make voluntary contributions of their technical skills as part of their community relations efforts (see Stanley & Rosenblatt #9).

1. A number of proposals attempted to find ways in which multinational corporations' subsidiaries, located in the developing countries, could be recruited and their talents drawn upon to strengthen the indigenous capabilities of the LDCs in which they are operating. A Cooperative Industries Program proposed by FMME gives details on how intercompany cooperation can be achieved to coordinate joint community service projects in LDCs (see FMME #36 as well as the FMME proposal dated 2/23/79. This concept is also mentioned in the OES/Dardis memo #101, dated 10/22/77, see also IASG #29, item 54

2. The Cooperative Industries Program proposal is but one specific suggestion for a mechanism to link the U.S. Industrial establishment with the LDC development effort. U.S. private industry R & D capability was also identified as offering a possibility for linkage with LDC R & D efforts. (see FMME #15 and IMDI #21). Specific proposals include:

(a) establishing a pre-retirement industrial fellowship program
(b) expanding the IESC
(c) Scientists and engineers of U.S. companies would be made available for short assignments in teaching and seminars
(d) courses could be set upon management of technology in LDC's run by U.S. companies.

3. Several proposals call upon the U.S. Government to fund consultants from private industry or retired personnel (or call for expansion of the IESC) to be made available to the developing countries to assist LDC firms in diagnosing their problems or in providing technical assistance to these public or private sector firms (see FMME #36 and discussions of the technology corps in NRC #18 and A.D. Little #30, Kinnelly #109, IMDI #21, IRI #20).

4. A proposal was made for a private sector program of regional technical cooperation in OES #101 and suggestions for firm-to-firm cooperative ventures contained in Kinnelly memo #109.

5. A proposal was made to use the Swedish model of a sister industries program as described in the DRI Report #5.

6. A proposal for sister company relationships in Agri-businesses contained in Aspen Workshop #32.

7. It was proposed to develop in LDC firms a capability to absorb technology by training their personnel in organizing their resources and directly their planning. (FMME #36)

8. A whole range of very specific actions for corporate initiatives to support LDC efforts to build an indigenous capability in the industrial and manufacturing field is set forth in the IMDI Report No. 21. For the sake of conserving space in this document we are not repeating the specific initiatives and suggestions for corporate actions detailed in the IMDI report. U.S. Goyernment leadership and financial support is required to implement these proposals.

The previous proposals for initiatives involve a modest contribution of U.S. Government official development resources. Other proposals call for a much more active and direct role of U.S. Government, either in providing significant incentives and subsidies across the board or in becoming more directly involved with the private sector on an operational basis in the technology transfer process. These initiatives are grouped accordingly in the following sections:

Incentives and Subsidies

9. It is proposed that the U.S. Government provide subsidies to reduce the cost of entry for small and medium-sized firms in overseas operations (see Stanley & Rosenblatt #9).

10. It is proposed that the acquisition of technology as a product by LDCs (and not as part of an investment) be subsidized by the developed countries. Know-how could be purchased by the AID donor and transferred to the LDC. (Stanley & Rosenblatt #9)

11. It is suggested that the developed countries establish a program to subsidize, on demand from an LDC, private sector consulting, training, licensing and management fees (see Stanley & Rosenblatt #9).

12. It was suggested that a change be made in U.S. policy which would facilitate the transfer of technology via used capital equipment (Stanley & Rosenblatt #9).

13. It was suggested that incentives be established for MNCs to do research and adaptive engineering on appropriate technology. (see Diwan and Livingston #4, Behrman #11?).

14. It was suggested that the U.S. Government should finance the analysis of costs and benefits of existing and proposed legislation in LDCs as they would affect supplier and the recipient of the technology (see DRI #5 and FMME #15).

15. It was proposed that the U.S. Department of Commerce utilize trade center exhibits, catalog shows, trade missions, identification of business opportunities abroad, etc. to promote medium-sized U.S. business activity in LDCs (see OES/Dardis memo #101 and Cooper/Benson Memo #104).

16. It was proposed that U.S. Government programs, i.e. EXIM Bank, OPIC, AID, etc., should be used to support agri-business development in LDCs (see Aspen Workshop #32).

17. It was proposed that OPIC provide protection against continual changes in contractual arrangements in LDCs (FMME #15).

18. It was proposed that the U.S. and other developed countries restructure their tax and incentive system to encourage their S & T communities to apply appropriate technology in the LDCs and also to encourage expanded emphasis on domestic R & D (see Stanley & Rosenblatt #9, DRI #5, FMME #15, and IMDI #21).

19. It was suggested that international awards and prizes be established for applied technology and R & D of particular relevance to LDCs (see Stanley & Rosenblatt #9).

19a. MNCs should be encouraged to establish a fund, managed by themselves, to support efforts by UN agencies, and LDCs to stimulate the growth of the private sector in LDCs. (Rudel #11
19b. US should encourage TNCs to cooperate with LDCs in implementing S & T policies (Behrman #119)

More Direct Operational Involvement by the U.S. Government

20. For a limited number of carefully selected industries there should be established research centers of excellence in LDCs to focus on practical application of technology in the production process. To a limited degree these centers might also do some R & D on a more imaginative search for appropriate technology to solve particular problems important to the mass of people in a given region. The centers should establish criteria for evaluating technology choices and develop standards to meet export requirements. These centers should not concentrate on basic science research (see Stanley & Rosenblatt #9 and FMME #15).

21. Regional technology centers should be established to identify specific needs for research, simplify the research process and undertake product development (see Stanley & Rosenblatt #9, Behrman #119).

22. A number of proposals emphasize that the U.S. Government should establish entities to broker arrangements between medium-sized companies in developed countries and companies in need of technology in the developing countries; for example, an international industrial R & D foundation was proposed that would provide grants to support new technology joint ventures in industrialization (see IASG #29, item 32).

23. The productivity centers in LDCs should be revitalized (NRC #18 and DRI #5).

24. Centers for small industry and rural technology in LDCs should be supported (NRC #18 and DRI #5).

25. The following specific operational entities should be established:

(a) an international subcontracting corporation
(b) a new enterprise development corporation
(c) an international resources bank
(d) an international technology transfer corporation
(e) an international congress on new enterprise (see Kinnelly Memo #116)

26. The NBS industrial research cooperative program should be continued (see Dardis #101).

27. The U.S. should finance R & D in appropriate technology (see Diwan & Livingston #4).

28. The U.S. should finance research on the process of industrialization in LDC's (DRI #5).

29. The U.S. should finance research on financing and marketing systems to support commercial and non-profit appropriate technology ventures (see Diwan & Livingston #4).

30. The U.S. government should establish a private corporation to provide seed capital, loan guarantees and to provide elements missing to the realization of market opportunities (see DRI #5).

31. It was proposed that the Peace Corps be expanded to include research scientists (Moravcsik #16).

32. Evaluate U.S. and international proprietary rights in the light of changing technology and changing world conditions i.e. to take account of genetic manipulation techniques (see World Food and Nutrition Study #17).

33. Investigate and recommend LDC national industrial property laws which would assist the transfer of proprietary technology. This program could be undertaken by AID in collaboration with the Patent, and Trademark Office of Department of Commerce (IASG #29, Item 34).

34. The U.S. Government should finance research on the industrialization process (NPC #18).

35. Programs should be undertaken for technological assessments of the industrialization process (see IASG #29, Item 33).

36. U.S. programs aimed at increasing the indigenous industrial capacity of LDCs should be increased from $10 million to $100 million (see Dardis memo #101).

37. Establish a technological information clearing house for technology transfer for mid-sized firms (see A.D. Little #30 and also IASG #29, item 51). This initiative is also discussed under the heading"Information Systems."

38. Establish an International Industrialization Institute (Behrman #119)

PROPOSALS FOR INITIATIVES - CHOICE OF TECHNOLOGY

Various studies emphasize the need to improve developing nations access to and use of technology. The proposals may be grouped as follows:

(a) Proposals dealing with actions to improve the diagnostic process within LDCs by which their technological needs are identified;

(b) Facilities to search for suitable technologies to meet those needs;

(c) Developing and applying methodologies to evaluate alternate available technological choices;

(d) Facilitating the acquisition of the technology selected by the LDCs.

Diagnosing the Need

The process of developing a capability to determine the nature of the problem and then to choose technologies to meet that problem, primarily involves the development of human resources in the LDC. This can be done most effectively by training programs, either in the LDC or abroad and by use of technical consultants. Therefore, proposed initiatives will have to stress the use of consulting services and skill training.

(1) Wallender makes the point that the search for and selection of technology is dependent upon an ability to correctly assess the problem to be solved. He proposes an "industry cooperative program" in which multinational corporations' subsidiaries in LDCs, together with local institutions and U.S. consultants, could cooperate in establishing training programs for small-and-medium-sized industries in developing countries to aid them in the selection of technology (see FMME-Wallender undated discussion Paper on Cooperative Industries Programs #118, also see DRI #5).

(2) The IMDI Workshops concluded that it is important to help LDCs identify technology needs in terms of realistic development goals and suggested that the U.S. Government assist LDCs in clarifying and coordinating their policies and improve their capability to chose technologies. (IMDI #2)

(3) The NRC (#18) states "we suggest that the U.S. propose international support for an activity that would (1) train persons in how to search for and select industrial technologies taking into consideration the comparative social and economic cost and benefits of alternate technologies; and (2) make these persons available to developing country governments and business firms to serve in what would be essentially a consulting capacity. The World Bank or an appropriate UN body might be the logical location for such an activity...consideration might be given to creating a center for the comparative evaluation of industrial technology." (see NRC #18, page 70 also see Wallender #36).

(4) The Technology Corps proposals (see Kissinger initiatives, #30 and NRC #18, page 65) or some expansion of the International Executive Service Corps should also be considered as a part of this initiative.

Searching for Technology

(5) This aspect of the choice of technology category clearly ties in with the information system proposals (listed separately) by which access to technological alternative choices must be established. The information systems proposals deal with (a) flows of technological information from developed countries to developing countries, (b) flow among developing countries and (c) flows within each developing country. There is clearly a consensus that developed countries should help LDCs establish networking systems by which such information becomes accessible (see Stanley & Rosenblatt #9).

A more detailed listing of initiatives for improving access to Developed Nations technologies can be found under the heading "Information Systems."

Evaluation Methodology

(6) A number of proposals recommend the development of a methodology for evaluation of technological choices and the training of LDC personnel in the utilization of these methodologies (see Rudel #111, DRI #5, Diwan & Livingston #4, NRC #18, U. of Michigan #8).

The general thrust is to redesign the technology assessment methodologies to reflect full social and environmental costs and benefits, including off-site and intergenerational benefits (for fragile environments).

(7) Develop analytical tools for Transportation Planning - for analysis of viable alternatives in Freight Transportation (IASG #29, item 38).

Acquisition of Technology

(8) Proposals were also made to provide training to LDC personnel in the art of negotiation for technology imports (see NRC #18, page 71 and Rudel #111).

(9) In addition there are proposals for aid donors to make a greater effort to assure that certain considerations governing choice of technology are cranked into their financing of LDC projects (see Michigan #8 calling for socio-culture assessments on any projects financed for fragile environmental and Stanley & Rosenblatt #9 dealing with appropriate technologies considerations).

PROPOSALS FOR INITIATIVES - INFORMATION SYSTEMS

Proposals for initiatives dealing with the flow of technical information to the developing countries seem to fall into two categories:

(1) proposals aimed at facilitating access to the supply of technical information in the United States or in other developed countries;

(2) proposals dealing with actions by the United States or other developed countries to assist in strengthening the demand side of the technical information flow (i.e., improving the functional capability of the LDCs to absorb and use the information).

Additionally, there are proposals dealing with the strengthening of the UN system to provide a better linkage between supply of information in developed (as well as developing) countries and the LDC users of that information. It is worthy of note that (with very few exceptions which shall be separately identified) the proposals for initiatives in this subject area tend to be mutually supportive and, if taken in their totality, could form a major initiative for the United States to be offered at UNCSTD.

An overall view of this subject area and of the kinds of initiatives which the U.S. might undertake is provided in the NRC paper (pages 27-29). It concludes "that...the United States, with its strong public and private capabilities, can help developing countries in three ways:

(1) by helping to strengthen national capabilities in information management,

(2) by developing programs to train information specialists and "consumers," and

(3) by promoting greater access to U.S. information resources.

Considerable opportunity exists for the private sector to become involved in these programs. The important thing is to tie information services as directly as possible to specific user needs."

Access to the U.S. Supply of Technology Information

a. Formal Systems

(1) It is proposed to strengthen, reorganize and expand U.S. technology information sources and services, (i.e. set up a Technical information clearing house to which private U.S. companies can contribute) to facilitate the flow of that information to the LDCs (see DRI #5 also IMDI #21).

(2) It is proposed to establish a Technical Information Search and Referral Service. (see Rudel #111; Packer #107 for U.S. Science and Technology Information Center; a similar proposal is also contained in NRC #18 pages 27-29).

(3) Improve access to NTIS (IASG #29, item 53).

(4) NTIS should be expanded to include U.S. patent information (Cooper/Benson memo #104).

(5) A U.S. Transporation Systems Center to provide data for Transportation Planning (IASG #29, item 39).

(6) Dissemination of U.S. standards, reference materials, and evaluated numeric data to LDC organizations (IASG #39, item 49).

(7) Improve distribution to LDCs of Scientific journals and reduce the NTIS page change to LDCs (Moravscik #16).

b. Informal Systems

(8) There is the general recognition that an automated data retrieval system (a formal system) would be insufficient by itself to facilitate the access of LDC users to U.S. technology. Thus, a supplemental system would be desirable utilizing informal networks of technologists who could be routinely contacted by telephone or conceivably be made available for short term work. (Rudel #111)

(9) It is proposed to increase the use of U.S. commercial attaches as access nodes to U.S. information systems (see DRI #5).

(10) It is stated that U.S. industry recognizes the need for an expanded government role in this field and would appreciate help in identifying opportunities in LDCs to meet technological needs (see IRI #20).

(11) It is proposed to expand ICAs focus on science and technology for development in their overseas operations (see Morgan #7).

(12) It is proposed to encourage trade associations (presumably both in LDCs and the U.S.) to get into the business of technical information flows (see Stanley & Rosenblatt #9).

(13) The ICA Academic Exchange program and the International Visitors Program should focus on information exchange among neighboring countries (IASG #29, item 46).

Technical Assistance to Assist in Strengthening the Demand Side

(14) It is proposed to assist in developing education programs in LDCs to encourage the general public to value, desire and seek knowledge (see Slamecka #13).

(15) It is proposed to provide assistance to LDC public communication media to increase their science coverage (see Moravscik #16).

(16) It is proposed to improve or subsidize the distribution of scientific journals to users in the LDCS (see Moravscik #16).

(17) It is proposed to improve the flow of information among researchers, producers and policy-makers within LDCs so as to emphasize availability, value and utility of technological information, particularly appropriate technology (see Stanley & Rosenblatt #9).

(18) It is proposed to assist in establishing consulting firms with expertise in information flows in the LDCs (see DRI #5).

(19) Seminars and workshops in LDCs to introduce information users to available sources of S & T information in the U.S. assistance and training to LDC libraries (IASG #29, items 41 and 45).

(20) It is proposed to provide supplementary training in the U.S. to LDC students who are here for other studies to familiarize them with the availability and operation of U.S. information systems (see DRI #5).

(21) It was urged that those LDC information network sources which would have access to information from abroad must also have the R & D capacity to produce new information (see Ranis in Stanley & Rosenblatt #9).

(22) It was proposed that information programs be designed to assure that there would be a flow of appropriate technology information from the LDCs to the developed countries (see Diwan of Livingston #4).

Proposals Dealing with the UN System

(23) Ranis (in Stanley & Rosenblatt #9) drew the conclusion that "it is a misallocation of limted resources to attempt to establish a highly centralized and bureaucratically controlled computerized technology information system." This is consistent with the general U.S. position on this subject which encourages the establishment of networks with linkages to the LDCs while taking advantage of existing information systems in the developed world. The memorandum dated August 31, 1977 drafted by OES (Younts/Kinnelly) refers to an "international center for exchange of technological information." The center would facilitate the linkages of a network of technological information. The UN Office of Science and Technology is currently evaluating the utility of establishing such a center which would have as a primary function the role of a coordinating unit of other UN systems . (See IASG #29, item 51).

(24) In reviewing possible U.S. initiative for information systems, we should keep in mind that there is already in existence an International Executive Service Corps and a program run by VITA, both of which are financed by AID. The proposal for a technology corps should be considered in the context of it being a supplementary system to a technology information system. Different levels of inquiry from users in LDCs would require differents levels of response; from a simple printout of the formal automated data retrieval system, ranging all the way to provision of a consultant to assist the user in diagnosing his technology needs and in evaluating his choices. It might be useful for AID or IFTC to establish an Information referral system, comprised of all existing facilities now funded by the U.S. Government and implementing the foregoing proposals. (Rudel #11.

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Other Proposals

(25) A weather and crop information system should be established (see NRC #18).

(26) A manual on U.S. Urban Technologies should be prepared for LDCs, to inventory and assess U.S. experience (IASG #29, item 35).

(27) A Global Epidemic Intelligence Service (IASG #29, item 5).

(28) It was suggested that the U.S. Government expand its programs to collect and disseminate more commercial information and be more active in advising MNCs and LDCs of opportunities to get together (IMDI #21).

PROPOSALS FOR DEVELOPMENT OF INDIGENOUS CAPACITY

More than 130 initiatives were proposed that are directly related to the development of indigenous capacity. A large number of these deal with manpower development and training in the U.S. and the LDC's. Some specifically deal with with role of U.S. universities and foundations. In considering these initiatives we should bear the following in mind.

1. Many initiatives proposed to T/CST are sector specific (energy, agriculture, population, industry). Nevertheless they are often aimed primarily at the development of indigenous capacity. Where those initiatives address a particular sector goal, they have been included in the listing for that sector. Where the initiative more broadly addresses the issue of creating or enhancing indigenous capacity in the LDC's the initiative has been included in this listing.

2. The linkage between research and training is crucial. It is possible, therefore, that proposals for research, contained in the sectoral listings should be tied to proposals for training contained in this listing. Moreover, proposals for training that do not envisage a linkage with research might well be expanded to include research.

3. The enhancing of indigenous capacity through manpower development often involves the provision of short-term consulting service of the kind that could be termed "informal training." We can divide initiatives in this area into those which deal with manpower training in a formal situation, both in the United States and in developing countries, and those dealing with manpower training of a more informal nature.

U.S. Policy Guidance

1. It was suggested that the educational systems in LDC's be designed to take into account the uncertainty in manpower forecasting (Kidd #6, page 90).

2. Assistance should be provided to LDC universities and private sector institutions to build a capability for them to complement the policy analysis by their government agencies (NRC #18, page 28).

3. U.S. assistance should be expanded to help create and develop engineering and manpower training institutions in LDCs (NRC #18, page 53; also FMME #35, page 8; DRI #5, page 127, Behrman #119).

4. Training (predominantly in-country training) needs to be strengthened in the following areas:

(a) infectious diseases of the tropics
(b) water systems
(c) contraceptive technology
(d) nutrition
(e) infrastructure for primary health care services including maternal child health and family planning
(f) operational planning and management of health, nutrition, and family planning programs
(g) policy planning and basic data systems (NRC #18, pages 78 and 79).

5. Several proposals deal with the need for increased U.S. Government funding authority for 211(d) programs to stimulate curriculum development, teaching, and research in U.S. institutions on subjects oriented to LDC needs (see DRI #5, page 128; Morgan #7, page 396; DRI #5, pages 128 and 191). Also see #119 Behrman, page 8.

A number of more general policy guidelines were included in the documents submitted to T/CST. These are:

6. U.S. assisted education programs in LDCs should be appropriate to the development level of the country (DRI #5, page 190).

7. U.S. scholarship programs for foreign students should be more specifically tailored to LDC needs (DRI #5, page 191).

8. Training should be performed for additional technician needed to undergird the engineers and scientists in all kinds of undertakings in the LDCs. (DRI #5, page 208).

9. The U.S. should help design technology training programs in LDCs including more innovative curricula (Kidd #6, page 101).

10. Selection of students from LDCs should be improved (Moravcsik #16).

11. Scholarships and research grants can be used more effectively as incentives to draw students into shortage areas and away from fields that are popular or appropriate to U.S. needs, but are not of high priority in LDCs (NRC #18, page 31).

12. LDCs should concentrate on improving indigenous educational systems, R & D centers and management institutes (IMDI #21, page 22; Behrman #119).

13. Include women in appropriate technology research and development (Diwan & Livingston #4, page 108).

14. Modify the Fulbright Exchange Program so it is less disadvantageous to the LDCs (Moravcsik #16, page 25).

15. Short training courses should be broadened to include a heavier component of S & T training with as much of the training as possible done in the LDCs (NRC #18, page 32).

16. Professional associations and engineering societies can be used more to help organize training, workshops, and symposia to maintain contact with U.S. trained LDC scientists and engineers who have returned to their host countries (NRC #18, page 32).

17. We should consider how development related training by US private industry might be expanded or improved (NRC #18, page 33).

18. It is desirable to increase incentives for the U.S. science and technology community to work on R & D related problems of the LDCs (NRC #18, page 34).

19. Encourage institution-to-institution relationships (Kidd #6, page 74).

19a. Provide assitance to LDC planners and policymakers in conceptionalizing the structure of their R & D institutions (#119 Behrman, page 5).

19b. U.S. should support and encourage International Financial Institutions to allocate fund in support of S & T infrastructure development (Behrman #119).

Establishment of New Institutions or Training Programs

20. It is proposed to establish a Study and Evaluation center in the U.S. for LDC government technocrats to increase the availability of qualified managers of technology transfer. The objectives of such a center would be to provide participants with an opportunity to review and assess the impact of government policies on technology flows and to acquaint them with new concepts, methodologies and perspectives. Provision should be made for U.S. business to cooperate closely with program implementation of such a center (FMME #15, DRI #5). Perhaps such a center could perform analysis of costs and benefits of existing and proposed legislation in LDC's as they would affect supplier and recipient of technology being transferred (see Industry Proposal #14; see #119 Behrman, page 5)

21. Establish courses on the management of technology in LDCs where U.S. companies are operating (FMME #20; also see a number of recommendations contained in IMDI #21 which makes specific proposals for linkages between the U.S. private sector and the LDCs needs; Behrman #119).

22. Training programs should be established to train LDC nationals (both public sector and private sector personnel) in the art of negotiating for the acquisition of technology (see Rudel #111 and DRI #5, page 137 and Kidd #6; Behrman #119),

23. Develop cooperative programs between U.S. universities and institutes and corresponding institutions in LDCs (Cooper/Benson memo #104).

24. Expand the Title XII programs to other fields and speed up implementation of existing programs. The U.S. should support a modest program to enable U.S. universities and other research institutions to cover some of the special overhead costs of international collaboration in R & D (to continue to exchange scholars, subscribe to each others journals, mount joint workshops, etc.) in order to cement continuing productive relations (NRC #18, also Morgan #7).

25. U.S. Government and private resources should be made available to U.S. business schools to develop teaching materials for LDCs. (FMME #15, page 14).

26. Establish training centers in LDCs to provide direct assistance to private and public firms to channel applied know-how to a few priority industries rather than concentrate on basic science research. The centers might establish criteria for evaluating technology and development standards to meet export requirements (Stanley & Rosenblatt #9; Behrman #119).

27. Provide substantial financing for a proposed technology information, adaptation and diffusion network in the LDCs that gradually redirect the efforts of LDC institutions now working on S & T (Stanley & Rosenblatt #9, page 64).

28. Establish the IFTC (Morgan #7).

29. It was proposed to establish a North-South Regional Development Center (see Martin Lees proposal #112).

30. The U.S. should expand support for multinational research and training centers.

31. Small American-managed institutes should be set up in LDCs to demonstrate by example how to do team work in research that lead to commercially viable end results (see IRI #20, page 13).

32. The U.S. should help expand training in LDCs in vocational subjects and technology support skills (Maintenance and Repair, Quality Control, Distribution) (NRC #18, Stanley & Rosenblatt #9; Behrman #119).

33. The U.S. should help fund U.S. university programs to attract LDC students in fields of high priority to LDCs (211(d)) (Kidd #6; Behrman #119).

34. U.S. should support special courses oriented to LDCs in U.S. universities to encourage foreign students to relate their training to problems and conditions of their country (211(d)) (NRC #18, page 31).

35. It was proposed to establish a Training Opportunity Center (see Packer #107).

36. The U.S. could provide incentive programs to encourage graduate students of LDCs to do their thesis on problems of importance in their country (NRC #18, page 32 and Kidd #6).

37. The U.S. should support seminars on problems of specific countries in those U.S. cities where there are large numbers of students from those LDCs (Kidd #6, page 73).

38. The U.S. should fund post-graduate summer programs on topics of interest to the LDCs (Kidd #6).

39. The U.S. should finance training courses on the appropriate technology concepts for foreign students in the U.S. (Diwan & Livingston #4).

40. The U.S. should establish a revolving fund for students from LDCs (Moravcsik #16).

41. Cooperative programs between U.S. technical agencies and LDC technical agencies should be undertaken (see Cooper/ Benson memo #104).

42. Fund the exchange of scientists and engineers working in LDC S & T institutes (see Dardis #101).

43. Provide technical assistance to help LDCs establish modern judicial systems (Cooper/Benson memo #104).

44. Expand technical assistance by the U.S. Justice Department to improve LDC capabilities to act against anti-competitive practice of MNCs (Cooper/Benson memo #104).

45. Contribute substantial support to the International Foundation for Science (Moravcsik #16).

46. Encourage projects among LDC's for sharing appropriate technology R & D program costs, management and information (Diwan & Livingston #4, page 108).

47. Expand systems to improve the capability of LDCs to conduct industrial research (DRI #5; Behrman #119).

48. Train engineering faculties in LDCs to perform preinvestment feasibility studies (DRI #5; Behrman #119).

49. Develop curricula in selected LDC universities for training local innovators and entrepeneurs to translate innovative ideas into commercially viable products (DRI #5; Kidd #6).

50. Establish an AT exchange network operating through non-governmental channels (Diwan & Livingston #4).

51. Expand U.S. assistance in developing within LDC universities, Centers for Small Industry Development (DRI #5).

52. The NSF staff submitted a series of initiatives to its planning and policy committee (an expanded SEED program, dissertation grants, LDC short

courses, visiting scientists, ASRA cooperative research, BBS cooperative emphasis, and SE planning) in a magnitude of approximately 1.5 million dollars per year. These proposals were not approved by the Committee (see NSF #105).

53. Include AT material in the U.S. input into the UNESCO training programs (Diwan & Livingston #4).

54. Develop better data on migration (Kidd #6).

55. Facilitative legislation is needed and restrictions removed to encourage U.S. R & D in development related areas (NRC #18, page 34).

56. U.S. Government should support local and regional appropriate technology centers (Diwan & Livingston #4).

57. Broaden the Peace Corps program in LDCs to include participation in science development projects and to include U.S. scientists on a research level (Moravcsik #16).

58. Adjust U.S. grant regulations to allow joint research grants with LDCs (Moravscik #16).

59. Establish and fund more research laboratories in LDCs (Moravscik #16; Behrman #119)

60. Assist LDCs in the evaluation of their research plans, proposals and institutions (Moravscik #16; Behrman #119)

61. The U.S. should continue and if necessary expand short-term exchanges of senior scientists, engineers and managers to discuss with colleagues in LDCs ways to strengthen mechanisms for bringing local scientific and technical expertise to bear on technical policies (NRC #18).

62. The U.S. should support training of U.S. experts who could consult with LDC planners on ways to institutionalize their science and technology in policy making (NRC #18).

63. Develop, in collaboration with LDC analysts, a program of research exploring ways to improve linkages among R & D institutes, and between them and individual enterprises (NRC #18).

PROPOSALS FOR INITIATIVES - FOOD, AGRICULTURE AND NUTRITION

In no other subject area has the United States participated as extensively and for as long a period of time as it has in providing technical assistance to LDC's in food, agriculture and nutrition. Proposed initiatives in this area, therefore, have strong roots in our past experience with AID and its predecessor agencies as well as with R & D performed or financed by the U.S. Department of Agriculture and responsive to the U.S. domestic requirements for food production, distribution and consumption. Furthermore, the World Food Conference held in Rome in 1974, focussed attention on the problems in this sector and gave rise to many proposals for initiatives as well as common action by the community of nations to overcome the problem of hunger and malnutrition. The National Academy of Science was subsequently asked to develop specific recommendations on how U.S. research and development capabilities can best be applied to meet the problems identified in the World Food Conference.

The NAS World Food and Nutrition Study, while not prepared specifically for UNCSTD, contains many proposals, a number of which have already been approved for funding and implementation within the U.S. Government, that are directly relevant to the subjects which will be discussed at UNCSTD. To provide a better understanding of the context in which to review other proposals for initiatives in this area, a brief summary of the World Food and Nutrition Study recommendations is attached as Annex A.

Perhaps the most comprehensive listing of proposed initiatives in this area are contained in the NRC paper "U.S. Science and Technology for Development." The research areas identified for more concentrated effort are consistent with the World Food and Nutrition Study. The proposals contained in the NRC Study are as follows:

1. Reducing post-harvest food losses

   "The United States should allocate more resources to this program. In addition we recommend that the U.S. encourage the formation on an international coordinating council on post-harvest food losses to provide a forum in which coordination could be worked out among presently scattered activities in the U.S. and elsewhere" (see page 7 and pages 116-120 . Also see IASG #29, Item 31).

2. Soil and water management at the farm level

"We recommend that the United States indicate its willingness to respond to requests from developing countries at international organizations in two areas:

(1) management systems for sustained crop production on tropical soils and

(2) water management for irrigation" (see NRC #18 page 8 and pages 121-124).

3. Plant and animal protection

"The U.S. should offer to collaborate with interested developing countries to train personnel and develop innovative programs for developing and promoting appropriate location specific test management systems for both crops and livestock...we recommend the United States enlarge its assistance to Departments of Entomology in developing country universities, work with government officials on ways to minimize environmental problems associated with pesticide use, and help make available information on the efficacy and defects of alternative pesticides in terms that are easily understandable to governments, formulators, applicators and farmers....Finally, we recommend that the United States support more complete worldwide collections of (1) germ plasm especially for crop varieties that have unique resistance to specific pests and (2) organisms injurious to crops and livestock." (see pages 9 and 10 and pages 132 through 137).

4. Overcoming Biological Limits to Plant Productivity

"We recommend (1) that the United States indicate its intent to accelerate basic research in the three areas...increasing biological fixations of nitrogen; increasing photosynthetic efficiency; and developing more powerful tools for genetic manipulation; (2) note the major benefits this is likely to bring for all countries, especially developing ones, and (3) report that U.S. research and international collaboration in this effort has already begun to intensify."

Proposed initiatives contained in the NRC Report which were apparently given lower priority are:

5. Weather and crop information systems (page 124) (also see IASG #29, item 30)

6. Farm and land use planning for sustained food production (page 128)

7. Management systems for sustained crop production (page 137).

Other recommendations for initiatives in this area are:

8. Adapt land use classification methodologies to specific conditions of LDCs especially with respect to fragile environments (Aspen Agri-business Workshop #32. See also study on fragile environments prepared by the University of Michigan #8).

9. Perform assessments of LDC food system development needs (Aspen Agri-Business Workshop #32).

10. The U.S. Government and LDCs should support technical assistance by food companies operating in the LDCs including long and short term training. (Aspen Agri-Business Workshop #32).

11. The U.S. should establish an agri-business advisory council, (Aspen Agri-business Workshop #32).

12. The U.S. Government should partially fund the private sector to do consumer education on nutrition. (Aspen Agri-Business Workshop #32).

13. Undertake programs to improve diets of children and reduce incidence of malnutrition (IASG #29, item 28).

14. More U.S. participation in the UN Associated Expert Program in Food and Nutrition (IASG #29, Item 29).

ANNEX A

The World Food and Nutrition Study identifies "high priority research" (Chapter 2) and indicates "how to get the work done" (Chapter 3). This problem area is very complex and composed of a number of critical interacting parts. Research and development are shown to be but two of the components of an effective program for lessening hunger and malnutrition. This study recommends:

1. Expanded research efforts to improve food and nutrition policies, increase food availability, reduce poverty, and stabilize food supplies;

2. actions to help mobilize and organize research and development resources in the United States and throughout the world; and

3. a U.S. government mechanism to better interrelate actions that affect food and nutrition situations both at home and abroad.

After reviewing over 100 priority areas identified by various study teams, the report finally settled on 22 priority research areas and recommended that U.S. research support be increased for certain lines of research identified within these 22 research areas. The research areas are:

I. Nutrition - Performance Relations
II. Role of Dietary Components
III. Policies Affecting Nutrition
IV. Nutrition Intervention Programs
V. Plant Breeding and Genetic Manipulation
VI. Biological Nitrogen Fixation
VII. Photosynthetics
VIII. Resistance to Environmental Stresses
IX. Pest Management
X. Weather and Climate
XI. Management of Tropical Soils
XII. Irrigation and Water Management
XIII. Fertilizer Sources
XIV. Ruminent Livestock
XV. Aquatic Food Sources
XVI. Farm Production Systems
XVII. Post-Harvest Losses
XVIII. Market Expansion
XIX. National Food Policy & Organizations
XX. Trade Policies
XXI. Food Reserves
XXII. Information Systems

The specifics of research required in these 22 areas is outlined on pages 7-16.

Recommendations for U.S. actions on "how to get the work done" emphasize the following. "USDA must develop a substantial and sustained international orientation and add to their traditional focus on U.S., a direct concern with hunger and malnutrition overseas. It recommends substantial increases in federal funding for the traditional USDA research programs and additional funds to establish a new program for competitive grants for research on food and nutrition. These increases are recommended on the order of $120 million for the first year, $60 million per year increase for the next four years to be divided equally between existing programs and the new competitive grants program. It recommends a five year federal matching grants program for non-federal research facilities and equipment arguing that a large infustion of resources is needed for altering and replacing existing obsolete facilities.

The report recommends that AID (1) increase the scale of its assistance and improve the substance of its activities to help establish research and development capacity in the developing countries, (2) support further development of international research centers and programs, and (3) support U.S. groups that wish to undertake food and nutrition research in developing countries. AID's level of $30 million per year should be at least tripled as rapidly as possible. It proposes that AID enlarge significantly its support for establishing operating relationships between U.S. research groups and those in the developing countries. It also emphasizes the use of Title XII, particularly to trained research personnel for the developing countries and to continue aid support for international research centers and programs. It recommends that NIH reorient its nutrition research to studies on human subjects.

It recommends that NSF substantially increase its support of fundamental research in biology and other natural science disciplines underlying work on food and nutrition, that the funding increase be complemented by increasing the size and duration of individual project financing and that it take vigorous action under its new mandate to promote international scientific collaboration.

More detailed discussions of these recommendations can be found on pages 18-24.

PROPOSAL FOR INITIATIVES - HEALTH AND POPULATION

1. U.S. aid programs and U.S. Government research efforts should be intensified and concentrated in the following areas:

(1) delivery of primary health care
(2) pure water and waste treatment
(3) control of tropical infectious diseases
(4) improve contraceptive technology (NRC #18)

2. With respect to tropical infectious diseases the U.S. should undertake the following kinds of activities: (IASG #29, Items as shown below).

(a) Expand the immunization programs, design and test immunization strategies and train local staff in LDCs (#7)

(b) upgrade tropical disease research units in U.S. institutions (#2)

(c) establish awards (young investigator awards) for research in tropical infectious diseases (#3)

(d) collaborate in international efforts to establish research centers for infectious disease control (#4)

(e) participate in global epidemic intelligence service to train health professionals in practical medical epidemeology and assign them to duty stations in countries served by WHO (#5)

3. The U.S. should define a strategy and provide resources to curb epidemics such as yaws (IASG #29, item 6).

4. On a bilateral basis the U.S. might create, jointly with certain LDCs, technology centers to do R & D in the basic human needs area (Stanley & Rosenblatt #9).

ENERGY INITIATIVES

Proposed U.S. initiatives for LDCs in the area of energy fall into three main categories:

1. Institution building
2. Education and training
3. Research and development

In Institution building, the U.S. might:

(1) support a network of regional R & D institutions in LDCs to concentrate on energy problems within each region (NRC #18, page 22 and IASG #29, item 16); and

(2) create an International Energy Institute to assist LDCs develop their energy resources and increase LDC access to energy technologies (Kinnelly #116).

In education and training, proposed U.S. initiatives are to:

(3) provide grants for the international education of U.S. and LDC personnel in energy technologies appropriate to LDCs (IASG #29, item 15);

(4) Convene energy seminars for LDC and MNC energy firms (Kinnelly #116);

(5) Hold energy planning management workshops (IASG #29, item 20);

(6) Create internships, in cooperation with private industry, so that individuals from LDCs can work directly in U.S. companies (NRC #18, p. 23);

(7) Sponsor a continuing series of regional seminars, workshops and symposia for exchange of information and ideas (NRC #18, p.23);

(8) Establish specialized advisory services to help strengthen LDCs capabilities to plan for energy development and promote efficient use of energy (NRC #18, p. 22); and

(9) Sponsor demonstration projects in LDCs in conjunction with local institutions to test local viability of innovative technology designed to reduce energy requirements in agricultural and industrial production (NRC #18, p.22).

In the area of R & D, proposed initiatives are:

(10) to assess energy needs of LDCs, especially in the area of renewable resources (IASG #29, item #21);

(11) determine national energy supply/demand resources and assess energy services (Jackson #102);

(12) conduct R & D in energy with countries such as Brazil and Saudi Arabia (Jackson #102);

(13) encourage government-sponsored R & D to be more responsive to work of importance to LDCs (NRC #18, p. 22);

(14) support joint teams of specialists from the U.S. and LDCs in cooperative study in energy-related areas (NRC #18, p. 22);

(15) develop a program for U.S. and LDC researchers to collaborate on small-scale projects in renewable energy resources (NRC #18, p. 22); and

(16) invite coal-rich LDCs to collaborate with U.S. research laboratories on RD&E in coal-related technologies.

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PROPOSALS FOR INITIATIVES - ADVANCED TECHNOLOGIES

Two major categories of initiatives have been proposed in the area of advanced technology:

Remote Sensing: using LANDSAT, may be used for crop forecasting, disease monitoring, measuring land potential for crops and livestock, mineral exploration, mapping and other uses.

Communications and Broadcast Satellites: using INTELSAT, are used for education and rural training programs and for establishing links among R & D institutes.

OES/State under the direction of Deputy Assistant Secretary Terrell is currently evaluating a NASA proposal to apply remote sensing for LDC needs. In addition, AID has already funded some projects in both remote sensing and use of communications satellites for various purposes. Many studies call for greatly enhanced use of satellite technology for LDCs and for expanding the AID and NASA experimental programs (NRC #18, p. 24, Shapiro #8, p. 183, IASG #29, item #52).

The attraction in proposing an expanded U.S. program in these two areas is the opportunity to build onto an already existing capability at low cost by adding ground receivers in LDCs and training LDC personnel in utilizing the information already being collected and transmitted by satellites in orbit. In this instance, the evaluation of proposals dealing with remote sensing is underway.

Initiatives

1. Continue the development of remote sensing technology and support international collaboration in establishing and operating an efficient network of receiving centers and ancillary services (NRC #18, p.24; IASG #29). Shapiro #8, p.249 endorses this initiatives but suggests that more regional rather than national centers be created.

2. Enlarge LDC access to remote sensing imagery and related data (NRC #18, p.24, Shapiro #8, p.249).

3. Expand training and R & D programs in LDCs to build capabilities for gathering and interpreting satellite generated data (NRC #18, p.24; Shapiro #8, p.246).

4. Help to adapt land use classification methodologies to special conditions within LDCs, partially through use of remote sensing techniques (Shapiro #8, p. 183).

5. Provide further support for experimentation with educational information uses of bradcasting satellites for international information exchange in receptive LDCs (NRC #18, p.24)

6. Perhaps a communications satellite could be set aside for scientific communication among LDC scientists (Moravcsik #16, p.26).

7. Department of Interior and U.S. Government should initiate and develop a mapping programs for LDCs to develop and enhance their in-country mapping capability.

8. U.S. Government to help explore mineral resources of South America (Kinnelly #116)

9. U.S. Government should undertake programs in earthquake protection, identification of seismic risk and earth resources (Dardis #101).

PROPOSALS FOR INITIATIVES - UN SYSTEMS

The initiatives for the UN System generally call for expanding the role of existing organizations either through increased funding to specific projects or through new projects under the auspices of established UN Organizations. None of the proposals suggest establishing any new UN institutions.

1. U.S. should support a trust fund (range $3 to $4 million) linked to UNDP in which technology assistance could be arranged to facilitate the flow of S & T in the Third World (Maynes #114).

2. Increase U.S. support for UN efforts to develop regional R & D centers (Wallender #36, page 182).

3. Increase U.S. support for UN effort to establish mechanisms for creating linkages between LDCs in order to develop more technology cooperation at the government level (Wallender #36, page 26).

4. Increase U.S. contributions to the UN "associate expert scheme" (Moravscik #16, page 26).

5. U.S. should grant funds to the UN Center on transnational enterprises or preferably to WIPO, to provide technical or expert services to LDCs in the selection of technology and the negotiation of technology transfers (Cooper/Benson #104, page 23). This would involve an expansion of the function of UNCTNE which is mandated only for to provide negotiating assistance to LDCs (Commission on TNCs, report of 2nd Session 3/76/E/5782, para 6). Selection skills involve extensive technical training.

6. Wallendar (#36, page 181) and Stanley & Rosenblatt #9, page 129 support UN role in helping LDCs search for, select and negotiate for technology.

7. U.S. should contribute to UNU which workds on development related issues. (Morgan #7, page 400).

8. U.S. should provide financial support for regional arbitration centers (Cooper/Benson Memo #104)

9. U.S. should provide a grant to the International Patent Documentation Center in Vienna to broaden LDC access to Patent information (Cooper/Benson #104)

10. It would appear to be a misallocation of limited resources to attempt to establish a highly centralized and bureaucratically controlled computerized technology information system as a means of informing developing countries of the range of technology choices they have available. (Stanley & Rosenblatt #9)

PROPROSALS FOR INITIATIVES - GENERAL AND MISCELLANEOUS

General Guidance for U.S. Policy Changes

(1) Developed countries should provide incentives to the private sector to engage in activities in technology transfer (IMDI #21).

(2) State Department and U.S. embassies should increase support for and train its commercial attaches and FSO's to deal with technology transfer to U.S. overseas business operations (IMDI #21, DRI #5, FMME #15).

(3) Strengthen the science role of the Department of State with respect to LDCs and establish more science attache positions at U.S. embassies (Moravscik #16).

(4) Establish an independent board under the President's science advisor in charge of S & T cooperation with LDCs (Moravscik #16; also see Behrman #119)

(5) Include in the President's committee on science and technology one member experienced in cooperation with LDCs (Moravscik #16).

(6) The U.S. should encourage LDCs to form indigenous government-business councils for liaison with the developed countries (IMDI #21).

(7) Provide legislative authority for federal agencies who have a primarily domestic mission, to work in international S & T and to include in their budget, funding for activities to supplement AID and IFTC. Also expand the international activities of the National Science Foundation (Morgan #7).

(8) In re-evaluating technical assistance programs the U.S. should distinguish between third and fourth world nations and their requirements for assistance (DRI #5).

(9) The U.S. Government should explore the replicability of the Israeli-U.S. bilateral R & D foundation and, if found feasible, establish similar organizations for U.S. relations with other developing countries (Dardis #101).

(10) The U.S. Government should also explore the feasibility of establishing bilateral joint economic commissions for cooperation in S & T with developing countries (Dardis #101).

(11) ICA should expand its focus on S & T for Development (Morgan #7).

(12) The U.S. Government should continue the business dialogue which was begun with UNCSTD (IMDI #21).

Miscellaneous Operational Program Ideas

(13) The U.S. should aid public communication media in LDCs to enlarge their science coverage (Moravscik #16).

(14) The U.S. Government should finance research to develop environmentally and technically sound technologies for solid and hazardous waste management (IASG #29, item #25).

(15) The U.S. Government should check water quality, hydrologic water loading and land use data throughout the world to validate and test EPA's water quality models (IASG #29, item #26).

(16) EPA should perform research on surface water technology for control of drinking water contamination (IASG #29, item #23).

(17) LDCs should (with U.S. assistance) develop and implement operational water management programs and develop long range plans for integrated water resource management (IASG #29, item #24).

(18) Department of the Interior water management and desalination program should be expanded (Dardis #101).

(19) An environmental cooperative program to solve common problem and build legal and management machinery for government control to assure protection of fragile ecosystems (Dardis #101).

(20) NOAA should undertake a program for development of coastal resources for the LDCs (Dardis #101).

(21) Research should be conducted on the marine environment and the use of marine resources (NRC #18).

(22) Research should be performed on the sustained use of forest resources (NCR #18).

(23) Programs should be undertaken in improving urban settlements (NCR #18).

(24) Programs should be undertaken with respect to urban congestion and planning transportation systems (NRC #18).

(25) Programs should be undertaken to provide assistance in upgrading intermediate cities and rural life (NRC #18).

(26) The U.S. Government should establish and finance an education program to explain the operation of the private enterprise system both in the U.S. and abroad. Such a program could be co-sponsored by U.S. companies (IMDI #21).

DEPARTMENT OF STATE

Washington, D.C. 20520

ANNEX I

OFFICE OF THE U.S. COORDINATOR FOR THE UN CONFERENCE ON SCIENCE & TECHNOLOGY FOR DEVELOPMENT

RESEARCH PROJECTS RELEVANT TO THE UN CONFERENCE ON SCIENCE & TECHNOLOGY FOR DEVELOPMENT

1. Development of a Methodology for the Collection of Data on U.S. International S & T Activities

   AUTHOR: Ted Schlie, Denver Research Institute

   SYNOPSIS: Methodology to identify and quantify all U.S. Government and private S & T activities dealing with problems of LDC's.

*2. International Spread of Innovation via Foreign Subsidiaries of U.S. Based Enterprises

   AUTHOR: Raymond Vernon, Harvard University

   SYNOPSIS: Examination of diffusion of technology to LDCs via subsidiaries of U.S. firms.

*3. Overseas R & D Activities of Transnational Companies

   AUTHOR: J. Behrman, H. Wallender, FMME

   SYNOPSIS: Examination of R & D efforts of MNC's in the LDC's.

4. Development Strategies & Technological Choices in Developing Countries

   AUTHOR: Romesh Diwan, Rennselaer Poly. Inst.

   SYNOPSIS: Examination of policy options available to LDC's to select technologies appropriate to their needs and local conditions.

5. Technology Transfer & Utilization in LDC — The Role of U.S. Public Policy

AUTHOR: Donald Evans, Denver Research Inst.

SYNOPSIS: Consideration of policies and action by U.S. Government entities which hold the prospect of significantly increasing the flow of U.S. industrial technology to LDC's.

6. Manpower Policies for the Use of Science & Technology in Development

AUTHOR: Charles Kidd, George Washington University

SYNOPSIS: Policy oriented analysis of manpower problems faced by LDC's as they undertake to use S & T for development.

7. The Role of U.S. Universities in Science & Technology for Development: Mechanisms & Policy Options

AUTHOR: Robert Morgan, Washington University, St. Louis

SYNOPSIS: Examination of Role of U.S. universities in helping developing countries to build an indigenous S & T base.

8. Science & Technology for Management of Fragile Environments in Developing Nations

AUTHOR: Kenneth Shapiro, University of Michigan

SYNOPSIS: To identify policy options with respect to the use of S & T in management of fragile environments in LDCs.

9. Obstacles & Opportunities in Technology Utilization for Development

AUTHOR: T. Stanley, S. Rosenblatt, International Economic Studies Institute

SYNOPSIS: To analyze factors affecting supply and demand for appropriate technology in LDCs.

* 10. Conference on Technology Transfer Control Systems

AUTHOR: Tagi Sagafinejad, University of Washington

SYNOPSIS: Evaluation of governmental control systems instituted by LDC's to regulate the purchase of technology.

* 11. MNCs and Changing Conditions of Technology Transfer

AUTHOR: Jack Baranson

SYNOPSIS: Examination of recent innovative terms and conditions of private sector investment and licensing arrangements in LDCs.

12. U.S. Employment Implications Technology Transfer to LDCs

AUTHOR: Mintzes, Aspen Institute

SYNOPSIS: State of the art review of recent studies which have dealt with effect of U.S. direct investment and other technology transfers on U.S. employment and trade.

13. Technology Information Systems

AUTHOR: Copeland, International S & T Institute

SYNOPSIS: Examination of U.S. technology information systems that are relevant to meet LDC needs and the means by which they can b accessed by LDCs.

14. Omitted

15. Public Policy & Technology Transfer: Viewpoints of U.S. Business

AUTHOR: Fund for Multinational Management Education

SYNOPSIS: Examination by U.S. business community of the process of transferring industrial and business technology from the U.S. to LDC's via the private sector and the identification of actions by the U.S. and LDC's which could facilitate such transfers.

16. Science and the Developing Countries

AUTHOR: Michael Moravcsik, University of Oregon

SYNOPSIS: Examination of the role of science in the development process and the factors which contribute to the development of a science infrastructure in LDC's.

17. World Food and Nutrition Study: The Potential Contributions of Research

AUTHOR: National Research Council

SYNOPSIS: Identification of priority areas for research to attack the critical problems contributing to world malnutrition and hunger.

18. U.S. Science and Technology for Development: A Contribution to the 1979 UN Conference

AUTHOR: National Fesearch Council, National Academy of Science

SYNOPSIS: Identificaion of those areas which seem to offer the greatest promise for S & T to bring about major improvement in the quality of life in the LDC's.

*19. Licensing Executive Society Survey

Promised by LES by August 1978, never received

20. Workshops on Industrial Research and Science and Technology for Developme

AUTHOR: Raymond Sangster

SYNOPSIS: Discussion of issues affecting the potential research linkages between the corporations and LDCs

21. Science, Technology and Development

AUTHOR: B.C. Christensen, Danielle K. Simonelli

SYNOPSIS: Corporate input from the highest echelons of management on technology transfer issues most likely to arise at UNCSTD

*22. Workshop on Appropriate Technology

AUTHOR: Winrock International Conference Center

SYNOPSIS: Efforts of appropriate technology practitioners to guide U.S. policy for UNCSTD

*23. Business-Government Dialogues - Nigeria, Venezuela, India, Brazil

AUTHOR: Wallender - Fund for Multinational Management Education

SYNOPSIS: Exchanges between business and government communities on creating an acceptable science and technology policy relative to development goals.

*24-27. American Association for the Advancement of Science (AAAS). Four Workshops to be held in April and May 1979

*28. The Technological Base for Industrializing Countries

AUTHOR: Raymond Sangster

SYNOPSIS: NBS-AID seminar to explore needs for technological knowledge essential to the efficient establishment of industrial plants and the procedures for acquiring it and applying it

29. Interagency Study Group Reports (IASG)

SYNOPSIS: Proposals for initiatives by seven IASGs were submitted to NSF who placed them in computerized print-out form

30. Kissinger Initiatives

TITLE: Technology Corps: A Design Study

AUTHOR: Robert R. Nathan Associates

SYNOPSIS: Analysis of supply and demand aspects for a proposed Technology Corps

TITLE: Technology Transfer to Latin America From Small and Medium-Size U.S. Firms: Broadening the Channels

AUTHOR: Arthur D. Little, Inc.

SYNOPSIS: Exploration of cooperative ventures between small and medium-size U.S. firms and Latin American firms

32. Public/Private Collaboration and Third World Food Systems

AUTHOR: M. Wolff, L. E. Slater - Aspen Institute

SYNOPSIS: Business-government cooperation in developing better food supplies and nutrition

*33. Engineers' Joint Council Proposal

SYNOPSIS: Proposal to utilize 400,000 person membership for consultancy and access to information.

35. Business-Government Dialogue - Mexico

AUTHOR: H. Wallender, J. Smith

SYNOPSIS: Exchange on creating policy to encourage S & T within constraints of national development policy.

36. Technology Transfer and Management in the LDCs: Company Cases & Policy Analyses in Brazil, Kenya, Korea, Peru and Tanzania

AUTHOR: H. Wallender, FMME

SYNOPSIS: Discussion of problems of "user" firms, particularly as they affect receipt and use of technology

Additional information may be obtained from L. Rudel, T/CST, Ext. 24906

*Not yet completed and analyzed for this paper as of 3/15/79

A N N E X II

Memoranda and other Submission containing proposals for Initiatives for UNCSTD

101 Draft Memorandum dated 10/22/77 from OES to the Secretary (never signed or sent)

102 Letter dated Jan. 26, 1979 from Sarah Jackson, Department of Energy to Ambassador Wilkowski

103 Omitted

104 Memorandum dated December 20, 1978 from Deputy Undersecretaries Cooper and Benson to the Secretary

105 Memorandum dated November 7, 1978 from Allen M. Shinn, Jr. Executive Secretary, Subcommittee on International Science Activities to the Planning and Policy Committee, NSF

106 Draft Memorandum dated November 24, 1978 from OES to the Secretary (drafted by M. Prochnik) entitled U.S. Cooperation in Energy with LDCs

107 Working Group paper dated January 14, 1975 prepared by L.S. Packer entitled "U.S. Government Proposal to Service LA in S & T Transfer: The U.S. Coordination Center.

108 Memorandum dated January 31, 1979 from L.R. Marks (L) entitled "Report on International Communications Policy Meeting"

109 Memorandum dated October 10, 1978 from Francis Kinnelly (OES) entitled: "Recommendation for Further Action on Kissinger Initiatives"

110 Letter dated December 4, 1978 from Charles K. Paul (AID) to Father Theodore Hesburgh on Remote Sensing

111 Memorandum dated February 5, 1979 from L. Rudel (T/CST) entitled "Suggestions for Initiatives in Support of Technology Transfer via the Private Sector"

112 Proposal by Martin Lees, OECD for a North-South Regional Development Center

113 Monograph by Ward Morehouse dated May, 1978 entitled: Science, Technology and the Global Equity Crisis

114 Memorandum for the Files dated August 14, 1978 by Ambassador Wilkowski entitled: "Trust Fund or Special Fund for Technological Assistance"

115 Memorandum dated May 18, 1978 by L. Rudel entitled "Possible Initiative for UNCSTD - Establishment of a Private Enterprise Development Fund ($50 million).

116 Paper dated August 31, 1977 prepared by G. Younts and F. Kinnelly entitled "Proposals for the Transfer of Technology to Developing Countries"

117 Memorandum for the AID Administrator dated November 1, 1977 by R. H. Nooter entitled "Technology Transfers to Middle Income Countries"

118 Discussion Paper (undated) prepared by H. Wallender, FMME entitled "Initiating a Cooperative Industries Program."

119 Paper dated March 1979 prepared by Jack N. Behrman for FMME entitled "Proposed U.S. Responses to Needs for S & T in Industrial Development."

CRS-385

ANNEX III

DEPARTMENT OF STATE

OFFICE OF THE U.S. COORDINATOR FOR THE
UN CONFERENCE ON SCIENCE & TECHNOLOGY FOR DEVELOPMENT

Guidance for Inter-Agency Study Groups

Terms of Reference for Appraising Possible U.S. Initiatives for the UN Conference on Science and Technology for Development

Purpose

This paper sets our initial guidelines for the Interagency Study Groups (IASGs) for use in appraising possible US initiatives for UNCSTD. The term "initiative" is broadly defined to include not only projects and programs but also measures (legislative, regulatory or procedural) that could be taken by the U.S. in furtherance of the purpose of UNCSTD.

General Principles

The guiding principle in our preparations for UNCSTD is to identify opportunities for new or expanded forms of mutually beneficial scientific and technological cooperation with the developing countries. We seek a set of initiatives that will be simultaneously consonant with our own national interest and foreign policy objectives, as well as responsive to the developing countries' aspirations for more satisfactory fulfillment of basic human needs and for more rapid industrialization and modernization.

In assessing the relative merits of suggested U.S. initiatives, we must apply a sort of cost benefit analysis, taking account of political, economic and social considerations as well as scientific, technological and developmental implications for the U.S. and the developing countries.

Specific Criteria for Assessment

Important criteria for assessment include whether the initiative

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(1) would have a broad and significant impact on development and human progress, especially on the poorest sectors in the developing countries;

(2) is one on which the U.S. and developing countries have a mutual interest in collaboration and is supportive of U.S. domestic programs and needs;

(3) is technically feasible, i.e. whether the U.S. has the scientific and technical capability to carry out the initiative and whether LDCs could absorb/support it;

(4) would contribute significantly to LDCs' indigenous capabilities to assess, select, adapt and apply technology and underlying scientific knowledge;

(5) is politically acceptable to the U.S. and to developing countries;

(6) is financially reasonable;

(7) is defensible in the budget;

(8) involves "appropriate" or light-capital technology;

(9) is responsive to UNCSTD agenda items/subitems (attached);

(10) is likely to alleviate or overcome obstacles to social and economic development in LDCs;

(11) could be accomplished with present institutions/ mechanisms, or whether new ones are required.

Initiatives Recommended for Adoption by USG

After evaluating initiatives in light of these criteria and others that may evolve, IASGs should assign priority ratings - I, II, or III - to initiatives recommended for adoption as part of the US position for UNCSTD. The recommended initiatives should be set forth in the following format:

a. Description of initiative and priority rating (I, II or III).

b. Is initiative new or an extension or modification of an ongoing activity.

c. Source of initiative.

d. Annual cost to USG (describe probable cost at different reasonable levels of effort, depending on funding prospects).

e. Benefits of initiative to LDCs in near, medium and longer terms, including obstacles to development that initiative is likely to alleviate or overcome.

f. Benefits to US.

g. Agency(s) and or institutions responsible for carrying out initiative (US and LDCs)

h. What would be required to implement the initiative? 1) legislation, ii) funding, iii) additional personnel and/or institutions.)

i. Role of private sector in carrying out initiative either in association with government or independently and the extent of contribution required by the private sector.

j. When could initiative be put into effect?

k. For how many years would US support be required?

l. When would LDCs/US begin to realize significant benefits from the initiative:

m. Developing countries or regions where initiative to be carried out.

n. Relationship of initiative to appropriate technology.

o. UNCSTD agenda items/subitems to which initiative is relevant.

p. Environmental impact of initiative.

Appendix IX. Initiatives Relating to Regulations, Tax Incentives and Anti-trust Measures for UNCSTD, Synthesized From Research Reports and Other Studies Prepared for the Coordinator's Office, 1979

Source: Substantial research and drafting services by Austin Banks, an intern in the Science Policy Research Division, Congressional Research Service, July 13, 1979.

The following proposed initiatives relating to American business practices abroad, were discussed in two studies prepared for the State Department, Public Policy and Technology Transfer: Viewpoints of U.S. Business, sponsored by a consortium affiliated with the Fund for Multinational Management Education (FFME); and Science, Technology, and Development, a report prepared by the International Management and Development Institute (IMDI). (Both documents were cited above.) The initiatives were not summarized by the Department of State in its report: "The Ordering of Proposals for Possible Initiatives to Be Offered at UNCSTD."

The proposed initiatives are grouped into five categories:

- Regulation and policy,
- Training,
- Protection of technology rights,
- Trade,
- Cooperative ventures,
- Taxes,
- Antitrust, and
- Information transfer.

The FFME study is cited as F below; the IMDI study is cited as M below.

A. Regulation and policy:

1. All relevant Federal departments and agencies should assume a uniform and positive stance towards technology transfer. The U.S. Government should resist pressures for more regulation of technology outflows, except in case of national security in order not to restrict the innovative requirements for world trade. (F, p. 12.)

2. National governments should uphold the rights of receivers and suppliers of technology to exchange information about improvements in technology. (F, p. 16.)

3. Increased costs or refusal to supply technology will result if the supplier of technology is required to guarantee the quality of the final product without controlling the application of the technology. (F, p. 16.)

4. Developing countries should evaluate the effect of their regulations on technology transfers to determine whether the regulations have impeded or encouraged such transfers. (F, p. 17.)

5. LDC governments must provide a favorable environment for technology transfer. This includes a stable investment climate and consistent policies. (M, p. 14.)

6. The U.S. Government, without imposing further cost burdens on business, should develop information on technology transfers in order to clarify the costs and benefits of both existing and proposed economic policies as well as recording models of success and innovation in technology transfer. (F, p. 30.)

7. A U.S. agency or some mechanism should be established to coordinate U.S. technology transfer and international policy. (M, p. 14.)

8. The State Department science office should address the technology needs of the American business and commercial communities in policymaking. (M, p. 66.)

B. Training:

1. Firms may be willing to enter into contracts to supply training and organizational development as a major activity abroad, especially for foreigners in countries where the firms are already active. (F, p. 28; M, p. 19, 27.)

2. Firms should provide apprenticeships within the company for host nations. (M, p. 19.)

3. Education programs as well as frank and practical dialogue should be mounted in order to clarify the realities of technology tranfer and the factors that condition program development in the U.S. Government. (F, p. 33.)

4. Firms should encourage Junior Achievement-type programs in LDCs where young people begin and run their own businesses. (M, p. 19.)

C. Protection of technology rights:

1. Improvements to the technology which might be offered during the term of a license agreement should have the same term as the original agreement. (F, p. 16.)

2. The United States should support the protection of property rights when the subject is discussed at the UNCSTD. (M, p. 17.)

D. Trade:

1. To encourage increased technology transfers by foreign corporations, developing countries should permit compensation to be freely negotiated between the contracting parties. (F, p. 11.)

2. In international fora and bialteral discussions, the United States should affirm the merit of the existing transfer system and its relevance to development. (F, p. 12.)

3. U.S. companies should more effectively measure and explain the costs and benefits of their technologies in relation to development efforts. (F, p. 12.)

4. Since technology transfer involves different types of MNCs, LDCs and technologies, participants should be allowed to choose the transfer arrangement that best suits them. (M, pp. 14-15.)

E. Cooperative ventures:

1. Efforts should be made to increase cooperation between business, government, and other interested groups in the process of policy formulation and review. (F, p. 19.)

2. Representatives of the private sector should be included as members of U.S. delegations to international conferences to discuss the role of corporations in technology transfer. The United States should encourage developing countries to include private sector representatives on their own delegations. (F, p. 19; M, p. 65.)

3. U.S. firms in LDCs might be encouraged to work with volunteer

and government agencies in cooperative programs. The firms' costs should be covered either by payments or other concessionary benefits. (F, p. 28.)

4. Permanent work programs could be established between the U.S. private sector and the U.S. Government, especially for middle management and technician groups, who could plan practical long-term program proposals. (F, p. 33.)

5. Formal programs, especially joint programs, probably should be avoided unless they occur in the normal course of conducting business. (M, p. 21.)

6. Regional and other types of LDC coordination mechanisms may be useful for developing countries to learn fromn each other's science and technology and to allocate production and to consolidate markets. (M, p. 23.)

7. Firms should consider constructing housing and other physical infrastructure in the LDCs using materials provided by MNCs and local labor. (M, p. 24.)

8. Joint business-government efforts should be profitable in the long-term at least and should eventually be able to operate without government subsidy. (M, p. 24.)

9. The U.S. delegation to UNCSTD should clarify the potential positive contribution of private sector efforts in science and technology; the delegation should have an understanding of U.S. business views on investment guarantees and the cost of technology. (M, p. 65.)

10. A top level management liaison group could be established to work with the U.S. Government to determine how best to tap already existing government sources of business and commercial intelligence. (M, p. 67.)

11. A joint government-business council could be formed in the LDCs for liaison and communication purposes and for analyzing needs and capabilities. (M, p. 70.)

12. The U.S. Government should investigate what other governments are doing in cooperation with their own companies to promote technology transfer and should determine how the results might be applied in the United States. (M, p. 71.)

F. Taxes:

1. The Government should reconsider Internal Revenue Service regulations that require R and D expenditures to be reallocated to operating subsidiaries, in light of the impact of such regulations on the international transfer of technology. (F, p. 19.)

2. The Government should reconsider U.S. tax laws that negatively affect the employent abroad of U.S. citizens, specifically Section 911, of the U.S. Internal Revenue Code. (F, p. 18.)

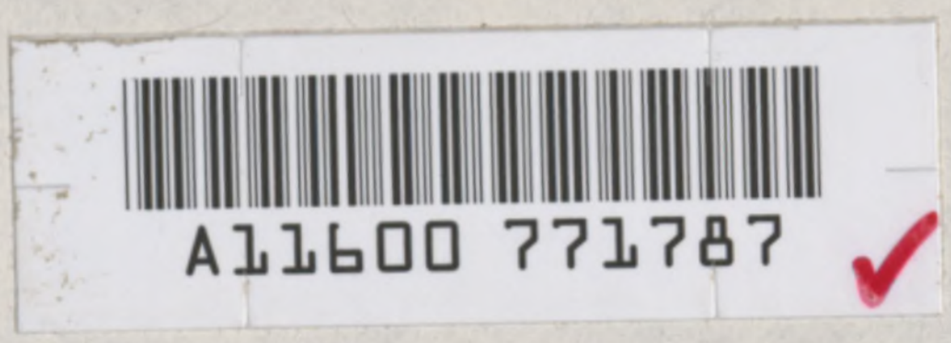
3. The Government should negotiate bilateral tax treaties or agreements specifically aimed at eliminating double taxation for U.S. firms in developing countries. (F, p. 18.)

G. Antitrust:

1. The Government should review the application of antitrust legislation in light of national interests in the international transfer of technology, espcially international licensing, joint ventures, trade, and investments. (F, p. 18.)

H. Information Transfer:

1. The State Department could assist in the exchange of information between MNCs and LDCs. It could advise MNCs on LDC investment attitudes, laws, and opportunities. It could advise LDCs on the impact of their foreign investment regulations and on opportunities for acquiring U.S. technology. (M, p. 22.)


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