309.22 RF
I 61

PN-AAK-343

THE UNITED STATES AND THE MIDDLE INCOME COUNTRIES; TECHNICAL COOPERATION TO ASSIST THE LOW-INCOME COUNTRIES

Submitted to:

THE INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL COOPERATION PLANNING OFFICE

By:

THE INTERNATIONAL SCIENCE AND TECHNOLOGY INSTITUTE, INC.

ACKNOWLEDGEMENTS

This paper was prepared under a contract to the International Science and Technology Institute, Inc., (ISTI) from the Planning Office for the Institute for Scientific and Technological Cooperation. John Hurley, serving as a consultant to ISTI, was the author of the paper and wishes to acknowledge with thanks the ideas and helpful criticisms provided by Henry Arnold, B.K. Wesley Copeland, and Victor Rabinovitch. The bibliography was prepared by Gregory Malinowski of the ISTI staff.

PREFACE

This report examines the possibilities for addressing problems of the less developed (or low-income) countries through cooperative efforts between the United States and the more advanced developing countries, frequently called "middle income countries."

Prepared at the request of the Planning Office of the proposed Institute for Scientific and Technological Cooperation (ISTC), the report considers the rationale for cooperation between the United States and middle income countries. It then outlines those development needs of the poorer developing countries that seem especially appropriate to assistance involving combined United States-middle income country approaches. Finally, it suggests illustrative programs and program mechanisms for these combined efforts.

The report is concerned with an ultimate objective of helping meet the needs of poor people in the less developed countries, yet its primary focus is on needs for which there are useful solutions and experiences in middle-income countries. While it stresses the importance of scientific and technological cooperation between the United States and middle income countries, it examines only one aspect of a wide spectrum of possible cooperative relationships.

In order to provide additional information on the topic of technical cooperation and the middle and low income countries, the report includes a bibliography of selected and illustrative documents.

B.K. Wesley Copeland
President, ISTI

TABLE OF CONTENTS

Page

Acknowledgements

Preface

I. THE MIDDLE INCOME COUNTRIES

Introduction. 1
Defining the Middle Income Countries. 2
Significance of the Middle Income Countries 7

II. SCIENTIFIC AND TECHNOLOGICAL COOPERATION BETWEEN THE U.S. AND THE MICs

Needs of the MICs 12
U.S. Interests in Cooperation with the MICs 13

III. THE CASE FOR US-MIC COLLABORATION ON PROBLEMS OF THE LESS DEVELOPED COUNTRIES

Mutual Interests. 19
Relevance of MIC Development to Other Developing Countries 21
Existing MIC-LIC Technical Cooperation. 22
Technical Cooperation on a Commercial Basis 23
Joint U.S.-MIC Technical Cooperation with the Low Income Countries 24

IV. PROGRAMS FOR U.S.-MIC COOPERATION WITH LICs

The Role of the ISTC. 27
Criteria for U.S.-MIC Collaboration on Development Problems 29
MIC Potential for Collaboration 31
Linking ISTC Program Focus with MIC Strengths and Interests. 36
Program Mechanisms. 39
General Program Principles. 46
Program Content and Funding 48
Conclusion 53

References

Bibliography

I. THE MIDDLE INCOME COUNTRIES

Introduction

During the past decade a number of the developing countries have made substantial progress in economic development. Through the exploitation of natural resources for which world demand is great, through increased industrial capacity and exports -- and in some cases through a combination of both resource exploitation and industrialization -- certain countries have generated remarkable economic momentum. These countries have been called the "middle income" developing countries and, in many of them, United States foreign assistance programs have ceased or have been substantially reduced.

The middle income countries are important to the U.S. Some are suppliers of critical resources, some are major trading partners -- and competitors -- for manufactured goods, technological products, and services. Individually and as a group, these countries are influential political elements in international relations.

Science and technology are important elements in the economic and social development of the middle income countries. Science -- the search for new knowledge -- and technology -- the application of knowledge to specific uses -- have led to important gains in agriculture, medicine, and industrial processing and manufacturing. Improved engineering and management have provided essential support for these scientific and technological gains.

Paradoxically, however, there is a vacuum in U.S. scientific and technological relations with the middle income countries. This vacuum

exists despite their economic and political importance to the United States and despite the catalytic role that science and technology can and should play in their present and continued well-being.

Defining the Middle Income Countries

The "middle income countries" (MICs) are not precisely defined, nor does the term, by whatever definition, embrace a very homogeneous group of nations. The important concept to be conveyed here is the significance of the MICs and their importance in cooperation for development, not the details of definition. The criteria used to classify MICs are based on certain somewhat arbitrary assumptions; moreover, the list of countries that fit a particular set of criteria is likely to change frequently. With these caveats in mind, however, this section will describe several ways of classifying MICs and will propose criteria to be used in this report for purposes of illustration.

One source has characterized 38 countries with per capita GNPs of $300 - $699 as "lower middle income countries," and 38 countries with per capita GNPs of $700 - $1,999 as "upper middle income countries." (See Table 1a.) For purposes of the U.S. foreign assistance program, the Agency for International Development (AID) generally refers to the middle income countries as developing countries with per capita GNPs greater than $550, but makes several exceptions to include countries with lower per capita GNPs (India, Pakistan, Indonesia, Nigeria, Philippines). Since most countries with per capita income above $550 per year are considered ineligible for AID assistance, this use of "middle income" refers to AID "graduate" countries or countries that do not have AID programs.

The third annual report from the President to Congress on developing countries considers middle income countries as those with per capita incomes ranging from $500 up to about $3,300. This classification includes 50 MICs with a total 1976 population of about 553 million.[1]

Using as criteria for definition a national population of at least one million, and per capita GNP between $450 - $1,000, then 22 countries would be classified as middle income. This latter group includes countries located throughout the developing world and ranging in population size from about 1 million to about 110 million. It excludes countries with centrally planned economies. (See Table 1b.)

If the ability to sustain economic growth is taken as an important indicator for defining middle income countries, the list becomes smaller than if GNP per capita is used as the criterion. Among countries with populations of one million or more, with GNP per capita between $450 and $1,500, and excluding centrally planned economies, thirteen nations sustained average real growth rates in GNP per capita of 3 percent or more from 1960-1976.

It should be noted, however, that economic indicators alone do not adequately reflect scientific and technological capacity, a capacity that is central to this report. Some countries -- such as certain OPEC members -- have high per capita GNPs but a paucity of scientific and technological personnel and institutions. Some countries -- such as Egypt, India, Indonesia, Pakistan, the Philippines, China, and Nigeria -- have relatively low per capita GNPs but relatively high numbers of trained personnel and scientific institutions, plus active and fairly sophisticated industrial sectors.

A classification of 38 countries as lower middle-income countries and 38 countries as upper middle-income countries.* The first category has countries with GNP per capita of $300-$699 (1976), and the second group includes countries in the $700-$1,999 range.

Lower Middle-Income (38)
(p/c GNP $300-$699)

	Population, mid- 1978 (mil.)	Per Capita GNP, 1976 ($)
Africa (17)		
Angola	6.4	330
Botswana	0.7	410
Congo, People's Rep	1.5	520
Equatorial Guinea	0.3	330
Ghana	10.9	580
Ivory Coast	7.2	610
Liberia	1.7	450
Mauritania	1.5	340
Mauritius	0.9	680
Morocco	18.9	540
Nigeria	68.4	380
Rhodesia	7.0	550
Sao Tome & Principe	0.1	490
Senegal	5.4	390
Seychelles	0.1	580
Swaziland	0.5	470
Zambia	5.5	440
Asia (6)		
China, People's Rep.	930.0	410
Jordan	2.9	610
Korea, People's Rep.	17.1	470
Korea, Rep.	37.1	670
Philippines	46.3	410
Thailand	45.1	380
Latin America (11)		
Belize	0.1	670
Bolivia	4.9	390
Colombia	25.8	630
Ecuador	7.8	640
El Salvador	4.4	490
Grenada	0.1	420
Guatemala	6.6	630
Guyana	0.8	540
Honduras	3.0	390
Paraguay	2.9	640
St. Lucia	0.1	580
Oceania (3)		
Papua New Guinea	3.0	490
Tonga	0.1	410
Western Samoa	0.2	350
Europe (1)		
Albania	2.6	540

From McLaughlin, Martin M. and the Staff of the Overseas Development Council. The United States and World Development: Agenda 1979 [published for the Overseas Development Council]. (New York: Praeger Publishers, 1979). pp. 158-163

Upper Middle-Income (38)
(p/c GNP $700-$1,999)

	Population mid-1978 (mil.)	Per Capita GNP, 1976 ($)
Africa (6)		
Algeria	18.4	990
Djibouti	0.1	1,940
Namibia	1.0	980
Reunion	0.5	1,920
South Africa	27.5	1,340
Tunisia	6.0	840
Asia (3)		
Iran	35.5	1,930
Iraq	12.2	1,390
Lebanon	2.9	1,070
Macao	0.3	780
Malaysia	13.0	860
Mongolia	1.6	860
Syrian Arab Republic	8.1	780
Taiwan (ROC)	16.9	1,070
Latin America (16)		
Argentina	26.4	1,550
Barbados	0.3	1,550
Brazil	115.4	1,140
Chile	10.8	1,050
Costa Rica	2.1	1,040
Cuba	9.7	860
Dominican Republic	5.1	780
Guadeloupe	0.3	1,500
Jamaica	2.1	1,070
Latin America (cont'd)		
Mexico	66.9	1,090
Netherlands Antilles	0.3	1,680
Nicaragua	2.4	750
Panama	1.8	1,310
Peru	17.1	800
Surinam	0.5	1,370
Uruguay	2.8	1,390
Oceania (2)		
Fiji	0.6	1,150
Pacific Islands Trust Terr.	0.1	990
Europe (6)		
Cyprus	0.6	1,480
Malta	0.3	1,390
Portugal	9.7	1,690
Romania	21.9	1,450
Turkey	42.2	990
Yugoslavia	22.0	1,680

TABLE 1b.

A classification of 22 countries as middle income countries. All have populations of one million or more and GNP per capita in the range $450-$1,000.* Countries with centrally planned economies are not included.

Middle Income (22)
(p/c GNP $450-$1,000)

	Population, mid-1978 (mil.)	Per Capita GNP, 1976 ($)
Africa (8)		
Algeria	18.4	990
Ghana	10.9	580
Ivory Coast	7.2	610
Liberia	1.7	450
Morocco	18.9	540
Namibia	1.0	980
Rhodesia	7.0	550
Tunisia	6.0	840
Asia (4)		
Jordan	2.9	610
Korea, Republic	37.1	670
Malaysia	13.0	860
Syrian Arab Republic	8.1	780
Europe (1)		
Turkey	42.2	990
Latin America (8)		
Colombia	25.8	630
Dominican Republic	5.1	780
Ecuador	7.8	640
El Salvador	4.4	490
Guatemala	6.6	630
Nicaragua	2.4	750
Paraguay	2.9	640
Peru	17.1	800
Oceania (1)		
Papua New Guinea	3.0	490

* Figures taken from McLaughlin, Martin M. and the Staff of the Overseas Development Council. The United States and World Development: Agenda 1979 [published for the Overseas Development Council]. (New York: Praeger Publishers, 1979). pp. 158-163.

TABLE 2.

The classification for middle income countries used for this report. Seven countries have GNP per capita of $550-$1,500, plus growth rates in per capita GNP of 3 percent or more from 1960-1976.* Seven other countries do not meet these economic criteria, but have significant scientific and technological resources. All countries have populations exceeding one million. Countries with centrally planned economies are not included.

	Population, mid-1978 (mil.)	Per Capita GNP, 1976 ($)	Per Capita Real Growth Rates 1960-1976 (%)
GROUP 1			
Brazil	115.4	1,300	4.8
Mexico	66.9	1,060	3.0
China, Republic of	16.9	1,050	6.2
Turkey	42.2	1,010	4.1
Malaysia	13.0	830	3.9
Tunisia	6.0	800	4.2
Korea, Republic of	37.1	700	7.3
GROUP 2			
Philippines	46.3	420	2.4
Nigeria	68.4	400	3.5
China, People's Republic of	930.0	370	5.2
Indonesia	140.2	280	3.1
Egypt, Arab Republic of	39.6	280	1.9
Pakistan	76.8	180	3.2
India	634.7	140	1.2

* GNP and GNP growth figures from 1978 World Bank Atlas, (published by The World Bank: Washington, D. C., 1978). Population figures from McLaughlin, Martin M. and the Staff of the Overseas Development Council. The United States and World Development: Agenda 1979 [published for the Overseas Development Council]. (New York: Praeger Publishers, 1979). pp. 158-163.

As a basis for discussion, this report will consider as middle income countries seven countries of over one million population that have a) per capita GNP of $550-$1,500 and b) sustained growth rates in per capita GNP of 3 percent or more. In addition, seven countries with large scientific and technological resources will be considered, although they do not meet the economic criteria just described. (For the list of fourteen countries, see Table 2.)

The classification just suggested excludes two countries with centrally-planned economies, and rather closed foreign relations (North Korea and Albania), and makes certain rather subjective judgements about the size and vigor of the scientific and technological communities of several countries.

The MIC classification used here excludes five countries (Costa Rica, Dominican Republic, Ecuador, Ivory Coast, Panama) that fit the economic criteria proposed for per capita GNP and for sustained growth because their economies depend largely on the export of primary products and they have relatively little industry or scientific and technological infrastructure. One might also argue that Singapore and Venezuela should be considered MICs; however, their per capita GNP is about $1000 higher than the richest country on the grouping used in this report.

Again, the classification used here is an attempt to be illustrative and to provide a backdrop for discussing the possibilities of collaboration with MICs on development problems. As actual collaborative programs are established, other countries undoubtedly might be included.

Significance of the Middle Income Countries

The middle income group suggested here represents over half the world's population (nearly one third if China were excluded). In world

trade, it exports at a total level of about $73 billion annually and imports goods and services worth about $85 billion. Various projections indicate that these high levels of trade are likely to grow two to three times higher in the 1980's.

The significance of the middle income countries cannot be assessed simply by figures on trade or population, of course; politically, they are a group of countries with considerable force. Collectively, they compose a sizeable bloc of the Group of 77 and include some of the Group's most influential members.

At the regional level, some of the middle income countries play critical political, economic, and ideological roles. Countries such as Brazil, China, Korea, Indonesia, India and Turkey are but a few examples of nations whose policies and well-being have important implications for the United States as well as for their neighbors. Moreover, a core of the most dynamic countries of the middle income group are exploring a variety of interesting and varied development strategies; their experience should be useful for other developing countries.

The importance to the United States of access to energy resources hardly needs mention, and a number of the middle income countries are critical suppliers of energy. Other key commodities and resources also comprise major portions of the exports of these countries. For example, Malaysia and Indonesia supply more than 70 percent of world exports of natural rubber, more than two-thirds of palm oil and nearly half of tin; Brazil and India supply nearly 20 percent of world iron ore exports. Strictly from the United States viewpoint, developing countries, including the middle income countries, supply more than half the U.S. consumption of

the following minerals: columbium, cobalt, aluminum, tin, and fluorspar. Developing countries additionally provide more than one third of U.S. consumption of manganese, mercury, and tungsten.

Special note should be taken here of U.S. relations with developing countries that are major exporters of oil and natural gas. The relatively high per capita GNPs of these countries exclude them from "middle income" classification, yet despite their financial and trade strengths, many oil-rich countries are poor in their physical, economic, and services infrastructure and in their scientific and technological base. Scientific and technological collaboration with the United States will be as important to their long-range development as to the middle income countries, and U.S. policy and programs should take this into account.

For a great many of the middle income countries, science and technology have been important elements in their economic and social development, and their importance will accelerate in the foreseeable future. As modernization and economic growth occur, new technical problems, new product and trade decisions, and new environmental and social challenges arise. These problems and challenges call not so much for theoretical achievement -- though good science has been done in many of the countries -- but rather for the practical application of science and technology to such basic tasks as the identification, extraction and processing of resources, the increased production of food, the development of manufacturing industries, and the improvement of health services.

The science and technology used in the middle-income countries has frequently been provided through external sources such as private industry, technical assistance from bilateral or international aid agencies, and

consultants from both private and non-profit organizations. As the recipient countries have strengthened themselves economically and industrially, however, they have increasingly strengthened their own capabilities to generate and adapt useful science and technology and have become increasingly sophisticated in both their scientific and technological needs and choices. Good equipment and advanced processes and plant layout, for example, have resulted in situations in which the productivity of some major industries in middle income countries is much greater than for similar industries in the United States.

Thus far, the importance of the middle income countries both globally and with respect to the United States has been noted here, as has the importance of science and technology in their development. The latter years of the decade of the 1970's have brought a growing international concern for narrowing the gap in science and technology between the developed and developing countries. The 1978 U.N. Conference on Technical Cooperation among Developing Countries (TCDC) and the forthcoming 1979 U.N. Conference on Science and Technology for Development (UNCSTD) have been crucial stimuli for the dialogue on closing the science and technology gap.

As part of its own participation in this international dialogue, the United States has been rethinking its policy and institutional positions on technical cooperation and assistance for the developing countries. Special opportunities and challenges exist both for cooperating with the crucial middle income countries and also for using this cooperation to benefit the low-income countries (LICs).

Despite nearly three decades of development assistance, seventy countries still have per capita GNP of less than $550; twenty-nine of this

group have per capita GNP below $200. New approaches to their development problems are necessary. The following sections describe a new kind of collaboration between the U.S. and the MICs which could use their combined resources more effectively on behalf of the world's poorest countries.

II. SCIENTIFIC AND TECHNOLOGICAL COOPERATION BETWEEN THE U.S. AND THE MICs.

Needs of the MICs

Despite their considerable achievements, the middle income countries still face formidable problems. Although many have reached relatively high per capita GNP, the distribution of wealth throughout their populations typically is very narrow and most of the countries have large numbers of poor people.

Many of the middle income countries now are grappling with the second generation problems of more intensive development. Industrialization, for example, has created unacceptable environmental problems in some places. The rapid and unplanned use of natural resources has created an urgent need for sound management and renewal of the resources where that is possible, or for planning the best economic stewardship and achievement of equity for non-renewable resources.

In most of the middle income countries, as in the other developing countries, economic achievements have not always come as a result of the participation of the entire labor force. One analysis has noted that "...it has become increasingly evident, particularly from the experience of the developing countries, that rapid growth at the national level does not automatically reduce poverty and inequality or provide sufficient productive employment." Nor will the problems of unemployment and under-employment disappear; the same analysis predicts that they will deepen.

> The growth of the labor force in the developing market economies has accelerated in recent years. It is likely that these rapid rates of growth will accelerate still further, and that the acceleration will continue for some time after the over-all rate of population growth has finally begun to slow down. The United Nations medium population variant (which assumes quite

substantial reductions in fertility) suggests that between 1975 and the year 2000 the labour force of all the developing countries (including China) will rise by some 75 percent.[2]

Another challenge faced by the MICs is the need to chart a development course that recognizes changes in the appropriate emphasis on labor and capital. As economic development occurs, labor costs often rise and give an advantage in certain types of industry to less developed countries with lower labor costs. Industrial planning and scientific and technological planning must involve farsighted strategies.

The rapid industrial growth of most of the MICs is accompanied by the phenomenon of rapid urbanization. Yet the growth of huge urban settlements is occurring at a faster pace and without the same level of supporting services and resources than was the case for the major urban growth in developed countries. More effective ways of providing basic necessities and services to urban dwellers need to be explored.

Urbanization and rapid industrialization have a profound social and cultural impact on the lives of people in the affected countries. Learning more about this impact and finding ways to help people cope with it are important tasks that must be continued and strengthened by the MICs if the ultimate objective is to provide better lives for their citizens.

U.S. Interests in Cooperation with the MICs

As suggested in the earlier section, "Significance of the Middle Income Countries," certain U.S. interests related to the MICs are critical, such as continuing access to energy resources and other vital raw materials. The world's industrial geography is changing and new competitors to the U.S. are emerging in many industries; both to sustain its trading position and to maintain a healthy level of employment, the United States must seek

additional trading partners and patterns and reexamine its political and economic relationships with other countries.

Despite the importance of the middle income countries to U.S. national interests and international interests in world order and fulfillment of human needs, and despite the continuing importance of science and technology to MIC economic and social development, this country has no clear technical cooperation policy for these important nations. This policy gap exists even though the United States has mechanisms for technical assistance for the low income developing countries, and rather clear policies and mechanisms for scientific and technological collaboration and exchange with other developed countries, and, in fact, with the socialist countries, ostensibly our principal opponents. (For the past decade, the U.S. has spent roughly $1.5 million annually just on individual scientific exchange with the U.S.S.R. and Eastern European countries.)

Ironically, United States technical assistance was a substantial factor in stimulating the successful economic growth of many of the middle income countries. Now that their industrial and resource infrastructure has begun to function effectively, now that they face new challenges and needs, these countries find no clear avenues for continuing collaboration with the nation possessing the world's most advanced scientific and technological capability. Although collaboration can and does take place through commercial channels, there is need for interaction not limited to specific products and processes defined by commercial interests. The interaction must be broad, long-range, and based on national interests and plans.

Studies undertaken in the early 1970's recognized that the United States would need to find new modes of cooperation with the advanced

developing countries. A report on a proposed new aid institution said

> The need for promoting and sustaining scientific and technical cooperation with the developing countries will remain long after the need for concessional economic aid diminishes.[3]

A U.S. team visiting Korea observed that

> Korea's future technical requirements, its needs for new competences and capacities, will result in part from its very success in reaching a higher, more complex level of development, and, in part, from the need to confront, largely for the first time, a wide array of noneconomic problems in which the country's experience needs to be greatly extended.[4]

Another report on a rapidly-developing country concluded that

> Cooperative relations with friendly developing countries which have reached the stage of self-sustaining growth and can manage their balance of payments are of great importance to the U.S. self-interest.[5]

The same report went on to say

> Indeed, as personal incomes mount and popular expectations rise, and as the economy begins to demand a more complex pattern of industrial infrastructure, the need for some types of technical help grows.[6]

Ironically, too, the present policy gap and the resultant obstacles to scientific and technological interaction come at a time when the United States should seek maximum opportunities for trade and investment with the emerging middle income countries and for the export of know-how and services to them. As we import from them at an accelerating pace, we must look for new opportunities for export and joint investment; these opportunities frequently will involve advanced processes, equipment, components, and technological services. If opportunities for interaction and cooperation are not explored by the United States, experience has shown that other advanced countries are ready and eager to fill the gap.

Ironically, the gap in policy towards MICs may mitigate against United States interests for world order and stability. If we stay aloof from the

scientific and technological development of the middle income countries and do not assist them in searching for ways to spread their economic and social gains more equitably throughout their populations, then we may well see an increase in symptoms of unrest and despair, resulting in emmigration to developed countries by skilled professionals and technicians, violent seizure of political power, or disturbances between different ethnic or religious groups.

The critical problems of the present and the future are global in scope and require global solutions. All nations face increasing interdependence in a world of growing population and dwindling resources. This country will need to share its own experience and knowledge as well as to learn from others, and we must develop new mechanisms for scientific and technological collaboration that are truly interactive and that recognize our mutual needs and interdependence.

The problems arising from the present high price and scarcity of fossil fuels provide excellent examples of interdependence (and the need to develop global energy policies and technologies). A recent article on oil prices states the following:

> The harmful financial consequences of the higher cost of oil imports for the U.S. balance of payments and the international value of the dollar are obvious. All the oil-importing nations will have to devote a relatively larger proportion of their foreign-exchange earnings to bringing in the same quantity of oil, and there will therefore be less money left over to pay for other goods. This will impinge upon the foreign-exchange earning power of the U.S. and many other countries.[7]

Despite the need for greater interaction with the MICs, our few government-to-government cooperation agreements in science and technology with MICs have been characterized by ambitious words and meager funds. The U.S. participation, moreover, usually must be justified on the basis

of cooperation on topics of mutual interest to both countries. As a result, the topics considered frequently are rather highly specialized and oriented towards basic research rather than towards broad national development needs, and ongoing substantive cooperation is rare.

The middle income countries are quite aware of the need and the potential benefit of maintaining strong scientific and technological links with the United States and other developed countries. Many of them have actively sought formal scientific cooperation agreements with the United States, generally implemented through the National Science Foundation. Many have also carried out collaborative programs with non-profit nongovernmental organizations such as the National Academy of Sciences, individual universities or university consortia, professional associations, and research institutes.

Cooperation through the nongovernmental organizations has permitted reasonable flexibility in topic and method of operation. Money for these programs has been scarce, however, hindering long-range planning and the capability to follow through on programs after an initial activity.

In recent years, AID has been given a legislative mandate to focus technical assistance efforts on poor people. While this focus represents a clear need, its interpretation and implementation tended to exclude efforts not aimed directly at the poor and thus to stifle both the building of S&T capacity in the developing countries and technical cooperation through the MICs. Although several other U.S. government agencies provide some technical cooperation and assistance to developing countries, their funding for these activities frequently comes through AID and thus bears constraints similar to those on direct AID programs.

On the other hand, the transfer of technology and the technical assistance provided through U.S. private business and industry do not face the same constraints as government-financed programs. Increasingly, however, the middle income countries and other developing countries have become suspicious of the motives of these companies and dissatisfied with the terms of access to private industrial technology. Rightly or wrongly (and as with most complex issues the facts look very different depending on one's perspective) the developing countries charge that Western private enterprise has supplied outmoded and costly technology and has failed to adequately help the developing countries strengthen their own technological capabilities. These issues have generated heated demands for change and a restructuring of the conditions and channels for the flow of technology between the developed and developing countries. These demands have arisen in international meetings such as UNCTAD IV and are likely to be renewed at the 1979 UN Conference on Science and Technology for Development.

III. THE CASE FOR US-MIC COLLABORATION ON PROBLEMS OF THE LESS DEVELOPED COUNTRIES

Mutual Interests

To a considerable degree, the rationale for middle income countries to maintain scientific and technological cooperation with less developed countries echoes the rationale for cooperation between the U.S. and MICs.

Many of the middle income countries rely on other developing countries to provide certain key resources. Three countries, for example, supply 84 percent of world exports of natural rubber. Four countries supply 44 percent of world copper exports. One country alone provides 44 percent of the world phosphate rock exports, while three countries produce over half of world tin exports.[8] The continued flow of crucial resources, therefore, provides a strong incentive for MIC-LIC cooperation.

Just as the United States will find it necessary to devote greater attention to the growing importance of developing countries as trading partners, so will the MICs. As the MICs expand their industrial production, the low income countries with their large populations, expanding economies, and, in many cases, physical proximity represent logical targets for the strengthening of trade relationships. Scientific and technological cooperation will be both a stimulus for trading ties and a necessary supporting service.

World and regional stability are as much in the national interest of middle income countries as of the United States -- if not more so. The middle income countries have made considerable strides in economic and social development, yet the margins of their national productivity are not broad enough to tolerate much political and international disorder or

strife. Self interest in this regard lends further support to the use of scientific and technological ties by MICs to help low income countries improve the lives of their people and strengthen economic stability.

The developing countries themselves, including MICs, clearly perceive the need for increasing their own interaction and cooperation. Various regional organizations and institutions have been established by developing countries for trade, economic, and technical cooperation. Examples include: (in Latin America) the Andean Pact countries, the Central American Industrial Research Institute -- ICAITI, and the Institute of Nutrition of Central America and Panama -- INCAAP; (in Africa) the West African Economic Committee -- CEAO -- a free market group, the Inter-State Committee for Combatting Drought -- CILSS -- of the Sahelian countries, and OCCGE -- an organization to fight major diseases; (in Asia) the Association of Southeast Asian Nations -- ASEAN -- a multifaceted organization that embraces trade, economic, political, and technical objectives, the Asian Institute of Technology (AIT) -- a graduate engineering school, and the South Pacific Bureau for Economic Cooperation. Many additional examples could be cited.

A strong focus was given to Technical Cooperation among Developing Countries (TCDC) by the United Nations conference on that topic held in Buenos Aires in 1978. The introduction to the conference report included these observations:

> This form of co-operation is not new. A large number of co-operative activities have been carried out among developing countries over the years and many are now in progress. What is new, however, is that co-operation among developing countries is now perceived by those countries to be increasingly important in promoting sound development in the present world context. Furthermore, the difficulties currently encountered by the world economy make it even more necessary for the developing countries

> to evolve strategies based on greater national and collective self-reliance, for which TCDC is an important instrument. This in no way reduces the responsibility of developed countries to undertake the necessary policy measures, in particular, the increase of development assistance for accelerated development of developing countries.
>
> TCDC is a multidimensional process. It can be bilateral or multilateral in scope, and subregional, regional or interregional in character. It should be organized by and between Governments which can promote, for this purpose, the participation of public organizations and, within the framework of the policies laid down by Governments, that of private organizations and individuals. It may rely on innovative approaches, methods and techniques particularly adapted to local needs and, at the same time, use existing modalities of technical co-operation to the extent that these are useful. While the main flows of technical co-operation visualized would be between two or more developing countries, the support of developed countries and of regional and interregional institutions may be necessary.[9]

Relevance of MIC Development to Other Developing Countries

Besides the broad issues of national interests and common global problems, there are sound practical reasons that lend appeal to the concept of technical cooperation between middle income and low income countries.

The development experience of the middle income countries has a special relevance to the low income countries. Economic growth and industrial expansion in the MICs has occurred largely within the timeframe of the past two decades; the economic strategies, the technologies, and the political contexts involved are still timely. Moreover, the need to build new institutions, to develop skilled professional and technical personnel, and to plan for technological change presents problems that the MICs are still facing, and view in a perspective that is different from that of countries whose industrial growth started in the last century.

In addition to the special relevance of their development experience, many MICs have a physical geography that is similar to that of a number of

LICs. This comparability is particularly important with regard to programs in such areas as natural resource management and development, agricultural production, construction, and health care.

Existing MIC-LIC Technical Cooperation

It is useful to note that some middle income countries have been engaged in technical cooperation with other developing countries for years.

Taiwan, for example, has cooperated with a number of African countries since 1961. As of December, 1977, Taiwan had seven technical projects in four countries -- Ivory Coast, Lesotho, Malawi, and Swaziland. Five of the projects were related to agriculture and two were concerned with handicrafts. The projects involved a total of 171 staff members based in the four countries. In Latin America in 1977, Taiwan had 14 technical missions (11 in agriculture, 3 in fisheries) involving 128 specialists and technicians in twelve countries -- Bolivia, Colombia, Costa Rica, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, Panama, Paraguay, the Dominican Republic and Uruguay.[10]

Some MIC-LIC cooperation has been carried out through the provision of technical training programs. The Republic of Korea (S. Korea), for example, offered training to a total of nearly 300 persons from developing countries in 1975 and 1976.[11]

Brazil maintains an active program of scholarships to Brazilian universities for students from other Latin American countries and from Portuguese-speaking countries in Africa. The Institute for Technology and Food Research (ITAL) has provided training courses in Portuguese-speaking countries.

Although not classified as a middle income country strictly on the basis of economic criteria, the People's Republic of China is a country with relatively advanced technical knowledge in certain areas and with large numbers of skilled personnel. For years China has provided technical assistance to other developing countries, particularly for large-scale construction projects such as the Tanzanian railway or a major highway in Pakistan.

Technical Cooperation on a Commercial Basis

The earlier mention of China's technical cooperation programs, based on the country's large numbers of skilled personnel, raises the point that several other developing countries, including MICs, are in a similar position concerning personnel. Many developing countries, of course, send workers abroad; a 1976 estimate described as "conservative" states that around 12 million Third World migrants are working in the industrialized countries and the high-income OPEC countries. Although the great majority of these workers are unskilled or semi-skilled, certain developing countries do send highly skilled professional and technical personnel to countries with high incomes but scarce resources of trained people. Egypt, India, Korea, Pakistan, and the Philippines especially provide personnel to other countries. The flow of scientists and engineers from developing countries for the decade 1962-72, for example, was as follows: from Asia, over 45,000; from Africa, nearly 4,000; from Latin America, over 8,500.[12] (These figures represent flows to all recipients, including the developed countries).

Technical cooperation on a commercial basis has obvious benefits to the sending country. For those countries that send large numbers of

skilled personnel abroad on a non-permanent basis, the remittances from wages and salaries are a significant source of foreign exchange. Some middle income countries also have major contracts abroad; an example is Korea, which had over half a billion dollar's worth of overseas construction contracts between 1966 and 1974. During that same period, Koreans working abroad remitted over $700 million in foreign exchange to their home country.[13]

The point to be made is that while the sending countries in the commercial relationship earn income, the recipient countries, which are poor in trained personnel, also reap major benefits.

Joint U.S.-MIC Technical Cooperation with the Low Income Countries

Thus far, this report has examined the rationale for cooperation between the United States and middle income countries and between the MICs and low income countries. Yet a question may well arise concerning the need or the logic for the U.S. to act in concert with an MIC on programs aimed at LIC problems; would it not be better for each to work directly with the recipient country?

It has been shown that these direct and independent approaches already are taking place by some MICs, and they will continue to be used. Insofar as the U.S. is concerned, bilateral programs will continue to be the principal direct aid and technical assistance vehicle for the foreseeable future.

A strong case can be made for joint U.S.-MIC approaches to LICs, however. The U.S. possesses technological, financial, and personnel resources that far exceed those of the MICs. The U.N. Conference on Technical Cooperation among Developing Countries recognized that the

developed countries are essential actors on the technical cooperation stage. The conference report said:

> TCDC is neither an end in itself nor a substitute for technical co-operation with developed countries. Increased technical co-operation of the developed countries is required for the transfer of appropriate technologies and also for the transfer of advanced technologies and other expertise in which they have manifest advantages. Further contributions from the developed countries are required for the enhancement of technological capabilities of developing countries through support to relevant institutions in those countries. TCDC can serve the purpose of increasing the capacity of developing countries to adapt and absorb appropriate inputs from developed countries.[14]

This report has previously discussed the special relevance of the MIC economic development experience to the needs of low-income countries. That relevant experience, combined with geographical similarities, language similarities, and a closer perception of the social and cultural dimensions of development, provides a powerful complementarity to U.S. financial, scientific, and technological resources.

Other practical considerations suggest the value of U.S.-MIC cooperation on problems of the low income countries. For certain problems, for example, the MICs simply possess more expertise than the U.S.; this point will be expanded in a later portion of the report that suggests illustrative U.S.-MIC programs for LICs. If R&D is needed for certain problems, it frequently may be advantageous to conduct the work in a middle income country. The physical environment often will be more suitable, the socio-cultural constraints may be more readily apparent, the costs of R&D personnel and facilities are likely to be lower, and scientific and technical personnel may be more interested in working on development-related problems than their counterparts in the developed countries.

U.S.-MIC collaboration in technical assistance, furthermore, seems likely to convey a positive image of United States foreign assistance activities. Such collaboration will be responsive to many recommendations of the TCDC Conference and likely recommendations of the August 1979 U.N. Conference on Science and Technology for Development. U.S.-MIC-LIC cooperation can soften the appearance, or the reality, of U.S. dominance in selecting development problem priorities and working out appropriate responses. This three-way cooperation also can demonstrate U.S. awareness that we have much to learn from other countries.

Finally, U.S.-MIC collaboration can bring new resources to bear on LIC problems through sharing of costs. If important problems are selected, of clear interest to all participants, then the MICs should be willing to share costs of the program in some reasonable way. Not only can this stretch the U.S. technical assistance budget, but it should also stimulate greater awareness and continuing interest among MICs on the benefits of technical assistance to LICs.

IV. PROGRAMS FOR U.S.-MIC TECHNICAL COOPERATION WITH LICs

The Role of the ISTC

The proposal for a new U.S. agency -- the Institute for Scientific and Technological Cooperation (ISTC) -- provides a focus for U.S. technological cooperation with developing countries. Broadly put, the objectives of the ISTC will be to help strengthen the scientific and technical problem-solving capacities of developing countries and to focus increased U.S. scientific and technological attention on development problems.

A stronger focus on science and technology for development requires new approaches both by the developing countries, which often lack the "critical mass" of scientists, technicians, and facilities to accomplish significant R&D on many problems, and by the developed countries, whose scientific and technical personnel often are unfamiliar with or disinterested in development problems or have little incentive to work on them. This situation is reflected by the estimate that "90 percent of the technological innovations take place in and for the developed countries, which have at most 30 percent of the world's population."[15]

The mandate that has been sketched out for the ISTC recognizes the need for new approaches to technological cooperation, and several statements in a document prepared by the ISTC Planning office provide a useful context:

> It is clearly understood that few of the complex problems which plague the development process will yield to solutions based purely on transfer of technology. Nor are such problems solved once and for all but require a constant process of growth and adaptation. These factors lend added weight to the desire of developing countries to build their own capacities for understanding and dealing with scientific and technological problems. The (ISTC) will consequently place high priority on working

> directly with institutions in developing countries and suporting cooperative relationships between these and U.S. institutions for the purpose of enhancing the capabilities of developing countries.[16]

Emphasizing the importance of collaborative efforts, the report adds:

> The Institute concept also recognizes that as the world becomes increasingly interdependent and as the number of capable scientists and institutions in developing countries grow, some problems of widespread importance can most effectively be addressed collaboratively. In dealing with such global concerns as energy and natural resources, environmental quality and food production, both costs and benefits can be shared.[17]

Addressing the possibilities for collaboration with the MICs, the report says:

> The establishment of the (ISTC) is based on the assumption that U.S. interests and involvements with developing countries will increase in the future, including interaction with the middle income as well as low income countries.[18]

The intention to focus on scientific and technological cooperation and the opportunity to involve the MICs in this cooperation represent important new directions in the U.S. technical assistance effort. Official recognition is now being given to the fact that the needs of poor people can be addressed in significant ways by science and technology and also that the middle income countries need to be made active partners in dealing with development problems.

The summary report on the ISTC lists the main characteristics of the Institute's planned approach to its tasks:

- A focus on the R & D function.
- Direct involvement of experts from the developing countries.
- Sustained attention to development problems by the science and technology community.
- Problem, not country, focus.
- Relationships with important "middle-tier" countries.

° Cooperation with the private sector.

In using a problem focus rather than a country approach, the Institute plans to concentrate most of its work in about ten major problem areas. The areas that have been proposed initially are:

1) Increasing agricultural productivity and rural income.
2) Improving health conditions in developing areas.
3) Improving population programs.
4) Improving nutrition.
5) Strengthening indigenous science and technology capacity.
6) Improved processes of technological cooperation.
7) Communications and information systems.
8) Energy planning and new energy supplies.
9) Environmental protection and natural resource management.
10) Non-agricultural employment.

The subsequent sections of this report will suggest the types of programs the ISTC might use to effectively involve the middle income countries in working on development-related problems of concern to themselves and to the low income countries. Possible criteria for collaborative programs will be outlined. Particular scientific and technological strengths and experience or opportunities for useful work will be discussed for a number of the middle income countries. Program ideas related to the ISTC's plans will be explored, and program mechanisms will be suggested.

Criteria for U.S.-MIC Collaboration on Development Problems

Certain general criteria may be usefully applied in the selection of the specific problems or topics for U.S.-MIC collaboration projects. The criteria might include the following (not listed in order of priority):

- The problem affects many developing countries, or large numbers of people in developing countries, and seems susceptible to scientific and technological approaches.

- Solutions to the problem require research and development, access to new technology or information, or improved planning and management.

- U.S. institutions or individuals have special expertise on the problem, or related aspects.

- The program mechanism used for the collaboration can be designed in such a way that both the participating MIC and LIC institutions will have their problem-solving capacity strengthened through improvements in personnel, facilities, or experience.

- Development of solutions to the problem, or development of expertise in working on it, will be beneficial to the U.S. for similar or related problems.

- A reasonable expectation exists that the efforts of other countries or institutions working on similar problems can be coordinated with the ISTC-supported work.

- The proposed work seems doable, and useful results with practical application can reasonably be expected within 5-10 years.

- There is reason to believe that future support will be available to implement practical results of the work on the problem.

- The collaboration will involve U.S., MIC, and possibly LIC institutions in areas that seem likely to lead to continuing institutional ties beyond ISTC's initial support.

Once problems have been identified as likely candidates for U.S.-MIC-LIC cooperation projects, the collaborating countries will need to be selected. Several criteria can be postulated as a basis for identifying potential country and institutional partners for the program:

- MIC or LIC institutions or individuals have special expertise on the selected problem, or institutions with strong potential for acquiring relevant expertise, or environments that are especially suitable for work on the problem.

- The possible cooperating MICs or LICs have a positive interest in the program, expressed through a willingness to bear some part of the program costs directly or through provision of services or facilities.

- Cooperating MIC or LIC institutions have adequate supporting personnel and facilities to ensure that the work can be accomplished without unreasonable delays or interruptions.
- Each cooperating country is willing to share fully with its partners all program-related data or other information.
- When other important criteria match, there is geographical proximity between MIC and LIC to facilitate ongoing linkages.
- When physical aspects of agricultural, environmental, or natural resource problems are involved, there is reasonable climatic and ecological comparability between MIC and LIC.
- The cooperating parties should be able to use a common language for purposes of program work.

Although the discussion of criteria for projects and for collaborating institutions centers on individual countries, the criteria also can apply to regional or international institutions located in developing countries and with a capability to work on development problems, and to private sector institutions as well as government organizations.

Having discussed program criteria for selection of problems and collaborators, the possibilities for useful collaboration with specific MICs will be explored in the next section.

MIC Potential for Collaboration

Among the fourteen countries suggested earlier for inclusion in the MIC classification, many have special strengths and experience in scientific and technological areas related to development. Additionally, a number of them have natural resources or environments of particular interest not only to their own development efforts but also to those of low income countries. Following are brief statements on each of the MICs, illustrating interesting possibilities for collaboration with the U.S. and LICs. The countries are listed according to the size of their international trade in order to

give some sense of their economic significance. (Figure shown is exports plus imports, rounded off to the nearest one hundred million.)[19]

1. Brazil ($23.7 billion) -- a large country with a large scientific and technological infrastructure, advanced industry, important natural resources. World leader in R&D on the production of alcohol fuels from renewable resources. As much as 60 percent of the flora of the Brazilian Amazon may be unknown and uncharacterized; offers the possibility of new plant species for food and fiber. Brazil has scientific strength and a good natural laboratory for work on tropical diseases, climatology of the Southern Hemisphere. Has made a large and successful investment in R&D to increase agricultural production; industrial R&D somewhat weak. Has much to offer the U.S. and LICs through collaboration.

2. Nigeria ($18.8 billion) -- an OPEC member, much of Nigeria's income is derived from oil production. The country has a sizeable group of scientifically and technically trained personnel and several good universities. An interesting program in postharvest food loss reduction exists at the Nigerian Stored Products Research Institute, Lagos; the International Institute for Tropical Agriculture is located at Ibadan and could be a useful site for work on increasing the productivity of tropical roots and tubers. The Institute of Agricultural Research of Ahmadu Bello University has done sound work on savanna agriculture. Nigeria has much to gain through scientific collaboration.

3. People's Republic of China ($17.0 billion) -- the world's most populous country naturally has large numbers of scientifically and technical trained personnel, a fairly large industrial base, and several centers where world-class scientific work is done. Yet China seeks to greatly

expand its trained personnel, acquire more sophisticated technology and gear more of its agriculturally-based economy to industry. China's national paper for UNCSTD reports that through 1985 the country plans to increase agricultural output annually by 4-5%, and industrial output by over 10%; scientific research personnel numbers are to increase from 310 thousand to over 800 thousand. The country needs more technical exchange, but also has useful experience to offer, especially in labor-intensive agriculture, industry, and public health. Particularly effective management and technology is used in large-scale food storage.

4. Republic of Korea (S. Korea - $16.5 billion) -- a country that is poor in natural resources, Korea has a wealth of experience in developing export industries and acquiring and adapting foreign technology. Has highly advanced facilities in steel-making and shipbuilding. Provides interesting experience in science planning and institution-building. The Korean Institute of Science and Technology (KIST) is probably the developing world's best-known and most successful industrial research institute. Good experience in utilization of marine resources, agricultural production, and reforestation. Much to offer developing countries and the U.S.

5. Republic of China (Taiwan - $15.7 billion) -- like Korea, Taiwan has been very successful in developing export industries, some of which compete effectively with those of the most advanced countries. Possesses experience in modernizing and increasing productivity of agricultural sector unequalled in developing world. Special expertise in electronics and telecommunications, fisheries, and engineering. Interesting exploitation of geothermal energy resources underway. Has been active in technical cooperation in other developing countries.

6. Indonesia ($14.2 billion) -- although world trade is sizeable because of oil production, Indonesia is low-income on per capita basis. Has relatively large number of technically-trained personnel. Has several good universities, several good research and teaching institutes such as Institute of Technology at Bandung, and Institute of Agriculture and Biological Institute, both at Bogor. Country faces major challenges in effective management of natural resources such as timber and water resources and in improving agricultural production. Has developed some degree of expertise in use of remote sensing techniques for resource mapping and management. Interesting work done in brackish-water agriculture. Good experience in programs of family planning.

7. India ($10.9 billion) -- in absolute terms, has one of the world's largest scientific and technological communities, produces a good number of world-class scientists. Much experience with Green Revolution agricultural practices for grains, development of water resources and irrigation. Strong engineering research and teaching at Indian Institute of Technology at Kanpur. Interesting spectrum of work on alternative energy technologies from biogas generators to nuclear power. Good programs in postharvest food storage technology. Good R&D infrastructure at laboratories of the Council on Scientific and Industrial Research.

8. Malaysia ($9.9 billion) -- much of its income comes from production of tin, rubber, palm oil and timber, but Malaysia has a substantial and growing industrial base and a well-educated population. The University of Malaya at Kuala Lumpur and the Science University at Penang are excellent institutions. Country has the world's outstanding Rubber Research Institute, and Institute of Tropical Medicine does first class

work. Strong experience in large-scale plantation agriculture for rubber and oil palm.

9. Mexico ($9.3 billion) -- Mexico's economy is still agriculture-based, but the industrial sector is varied and expanding. Good experience with R&D on wheat and cereal grain production, arid land agriculture. Monterrey Institute of Technology and Advanced Studies offers graduate programs and research in engineering to Mexican students plus students from throughout Latin America. Special expertise in biomedicine and geophysical research. Interested in technology for oil and mineral exploration, productive use of marginal land.

10. Turkey ($7 billion) -- a country with two-thirds of its labor force engaged in agricultural occupations, Turkey has a domestically-oriented industrial sector. Has particular strengths in technologies related to oil seed extraction and processing, use of seed cake for animal feed. Has several good universities. Interesting potential for work on agricultural systems for marginal lands.

11. Philippines ($6.6 billion) -- another primary producer and agricultural economy, country has many excellent scientists and technicians. Is actively developing geothermal energy production. Some experience and strong interest in timber products, utilization of agricultural waste products, agricultural mechanization. Interesting work done on leguminous fast-growing tree species and foods. Asian Institute of Management has good expertise on analysis of technology needs in industry. Although human resources in S&T are good, the country's S&T institutions need strengthening.

12. Egypt ($5.3 billion) -- a fairly poor country with a reasonably good scientific and technological infrastructure, the country is interested

in, and offers a good environment for, R&D in solar energy and in arid lands agriculture, techniques for exploring and mapping natural resources. Because of its institutional base, Egypt is a logical focal point for scientific and technological collaboration in the Middle East and North Africa if political considerations permit. Has a major S&T cooperative program with U.S.

13. Pakistan ($3.3 billion) -- outside of the agricultural production of the Punjab, Pakistan has limited natural resources. Like India, it has expertise in cereal grains, arid land agriculture, and use of water resources. With a modest but active industrial base, the country has a rather large research organization in the various laboratories of the Pakistan Council for Scientific and Industrial Research (PCSIR). Interested in agricultural mechanization, improvements in livestock. Large S&T community, many of whom go abroad for work.

14. Tunisia ($2.3 billion) -- relatively resource-poor, has reasonably good-sized quantity of technically trained people. Has a strong Institute of Nutrition which trains people from Francophone countries in Africa. Also has Francophone Africa trainees in medical work related to family planning programs.

The preceding capsule commentaries on the MICs clearly are not meant to be exhaustive; they simply illustrate a few of the problem and institutional strengths and some of the needs and interests in the various countries.

Linking ISTC Program Focus with MIC Strengths and Interests

Having identified about ten major problem areas as an initial focus

for its programs, the ISTC, especially in its early years, should seek to link those portions of its programs involving collaborative activities with MICs (and LICs) where real strengths and interests exist in relation to a target problem. As an illustration of how the process might work, the ISTC problem areas are listed here along with examples of MICs with potential for cooperative activities.

1. Increasing agricultural productivity and rural income

   Taiwan and Korea -- agricultural mechanization, effective R&D links with extension systems

   Brazil -- R&D in soybeans, nitrogen fixation

   Nigeria -- agricultural production on savanna lands, roots/tubers R&D

   Indonesia -- brackish-water agriculture

   India, China, Taiwan -- postharvest food storage technology

   Pakistan, India, Mexico, Egypt -- agricultural production on arid and marginal lands

   Philippines -- R&D on fast growing tree forage and new tropical crops

   Malaysia -- R&D and management for large-scale agricultural commodities

2. Improving health conditions in developing areas

   Brazil, Egypt, Malaysia -- tropical disease research

   China -- labor-intensive techniques for environmental health and sanitation programs

3. Improving population programs

   Indonesia, Korea, Taiwan, China -- policy and organization for family planning

   Tunisia -- medical training for family planning personnel

   Brazil, Mexico -- biomedical research

4. Nutritional Improvement

   Tunisia -- research and training

Philippines - testing new varieties of tropical crops

5. Strengthening indigenous science and technology capacity

Korea, Taiwan - science planning and organization, government-industry partnership for R&D

Brazil - Brazil chemistry program (joint program with NAS to strengthen specific areas of chemistry research)

Nigeria - effective on local S&T capacity of an existing international research institute in-country

6. Improved processes of technological cooperation

Korea, Taiwan, China, Brazil - technical cooperation programs with other developing countries

Mexico, Tunisia - training programs for students from other countries, plus local students (at Monterrey Institute of Technology and Institute of Nutrition, respectively)

Brazil - Brazil chemistry program

Korea, Indonesia, India - activities with U.S. institutions through AID science and technology grants or loans

Malaysia, Indonesia, Philippines - activities through ASEAN

7. Communications and Information Systems

Korea, Taiwan - R & D capacity, S & T information centers

Philippines - regional projects on agricultural information

8. Energy planning and new energy supplies

Brazil - R & D on alcohol fuels from renewable resources

India, Pakistan, Egypt - R & D on solar energy, energy from biomass, other alternative small-scale techniques

Philippines - testing energy plantation concept, geothermal development, fast-growing tree species

Taiwan - geothermal, biogas

Korea - biogas, industrial energy conservation

9. Environmental protection and natural resource management

India, Pakistan, Korea - reforestation programs

Brazil - survey and protection of Amazonian forest

Indonesia - resource exploration and mapping

Philippines - fast growing tree species

India, Pakistan - water resource management

10. Non-agricultural employment

Philippines - integrated rural development programs

Korea, Taiwan - industrial development and innovation strategy, government stimulation of industrial R & D

China - development of small and medium industry

Table 3 provides a diagramatic way of presenting the information just described for the ten problem areas.

In considering these examples of potential matches between MIC strengths and interests and the ISTC's program areas, it must be realized that interests and problem areas usually are overlapping and multi-dimensional. For example, work on reforestation or fast-growing tree species will have implications for energy planning, erosion control, rural employment and incomes, and other issues. Actual programs of collaboration on a particular topic, therefore, may well involve participants with expertise and experience in rather widely different topics.

Program Mechanisms

As a new and untried agency in inflationary times when government budgets are likely to remain tight, the ISTC will have to work within fairly stringent financial constraints. About $66 million in on-going research projects will be transferred to ISTC from AID, and about $25 million of "new" program money will be made available through the FY 80 AID budget.

Initially, then, only the $25 million from the FY 80 AID budget will be available for new programs, although some of the on-going research project money transferred from AID may be used in ways that complement new program ideas. It will be vitally important for ISTC to select problems and devise program mechanisms that are innovative and do not needlessly duplicate efforts being carried out by AID, other U.S. agencies, or international technical assistance organizations.

The ISTC will need to plan its programs of collaboration with MICs and LICs in such a way that good coordination is achieved with other U.S. agencies. A positive coordination should be attempted that seeks ways to include existing efforts of various agencies in a program package that will enable the ISTC contribution to be expanded and multiplied. The resources of the technical agencies of government and of the non-governmental scientific organizations frequently are especially suitable for work with fairly sophisticated counterparts, such as the institutions characteristic of many MICs. In addition to AID, ISTC should work closely with such organizations as the National Science Foundation, Department of Energy, U.S. Department of Agriculture, Appropriate Technology International, National Oceanic and Atmospheric Administration, National Institutes of Health, National Bureau of Standards, U.S. Geological Survey, Peace Corps, and the Interamerican Foundation, all of whom operate or sponsor programs involving MICs and other developing countries. The non-governmental organizations active with development problems include the numerous private foundations, Volunteers in Technical Assistance, the National Academy of Sciences, and many more.

In developing program mechanisms for collaborative activities, ISTC has the opportunity to review the experience of other organizations that

TABLE 3.

MIC PROGRAM POTENTIAL-ISTC PROBLEM AREAS

This table diagrams examples of matches between ISTC problem areas and MIC strengths or potential. Fourteen MICs are listed on the side, ten problem areas at the top; a mark (x) is made where problems match strengths or potential.

COUNTRY	Agric. Rural Income	Health	Population	Nutrition	S & T Capacity	Technological Cooperation	Communications Information	Energy	Environment	Non-agric. Employment
BRAZIL	x	x	x	x	x	x	x	x	x	
MEXICO	x	x	x	x		x		x		
TAIWAN	x		x		x	x	x	x		x
TURKEY	x	x		x						
MALAYSIA	x	x			x				x	x
TUNISIA		x	x	x		x				
KOREA	x		x		x	x	x			x
PHILIPPINES				x				x	x	
NIGERIA	x	x				x			x	
CHINA	x	x						x		x
INDONESIA			x			x		x		
EGYPT				x		x		x	x	
PAKISTAN	x				x			x		
INDIA	x				x	x	x	x		

have carried on such programs to see what applicable lessons have been learned. International cooperative activities are not usually simple to organize and operate. In education programs, for example, the faculty exchange method of collaboration frequently is not very attractive to the transferring faculty member.

One report has commented on this as follows:

> ...U.S. universities have experienced difficulty in enlisting the services of well-qualified faculty for educational programs abroad. Foreign assignments of two years or more -- typical of most arrangements -- are major diversions from the central mission of the home institution; a professor may have to suspend or forsake research and graduate programs that took years to construct. University administrators have few ways of evaluating the quality of faculty work done abroad and of crediting it toward promotions. Often the LDC assignment involves more teaching than research. And the applied research available may be quite primitive, with few opportunities to publish. Thus, many well-qualified faculty members have preferred not to become involved in a situation where the normal university and peer rewards are absent.[20]

The National Academy of Sciences experience with the Brazil Chemistry Program shows that putting young post-doctoral researchers from the U.S. abroad for 2-3 years presents certain problems; the NAS Fellows often had considerable difficulty in finding a position when they returned to the U.S. because their contacts were somewhat out-of-date and the quality of their overseas work not easily judged.

Nevertheless, positive experiences in collaborative activities also are plentiful. The point to be emphasized is for ISTC to become familiar with as many evaluations of them as possible; the search for insight also should extend to the technical cooperation programs MICs have conducted with other developing countries.

To give a sense of the coordination and review needed where technological collaboration is involved, the following information may be instructive:

Developing Countries with which U.S. has Bilateral Agreements in Science and Technology (NSF is responsible agency)

Brazil	India	Korea	Tunisia
Egypt	Iran	Mexico	

Developing Countries with Specific AID Science and Technology Grants or Loans

Brazil	India	Korea
Costa Rica	Indonesia	

An entire research project could easily be devoted to obtaining basic information on programs of collaboration between U.S. institutions and partners in developing countries. Books could be written on the successes and failures. It may be useful, however, to give an extremely limited sample of some of the types of collaboration that have been tried or now exist:

Research Institutes

Battelle Memorial Laboratories - planning, advice and support to Korean Institute of Science and Technology

Denver Research Institute - R & D management training with institutes in Indonesia, Thailand, and Brazil

Universities

Midwestern Universities Consortium for International Agriculture (MUCIA) - training and research in Indonesia

Colorado State University - planning, faculty, and administrative support to Asian Institute of Technology

Non-governmental Organizations

National Academy of Sciences - workshops and seminars on development problems in 25-30 countries; advisory committees with Korea, Taiwan, Egypt; Brazil Chemistry Program for 7 years

Volunteers in Technical Assistance (VITA) - advice and information (mostly by correspondence) with requestors from developing countries

Associations

American Society for Engineering Education - institutional development plan for IIT, Kanpur, India

American Council on Education Overseas Liaison Committee - exchange of information, advisory services on higher education in developing countries.

Government

National Bureau of Standards - advice to Korean Bureau of Standards

National Science Foundation - sponsorship of joint U.S.-LDC research programs on topics for which there is benefit to the U.S. as well as the developing country

Dozens of private foundations and scores of consulting firms have been involved with technical cooperation in some way, as have private industrial firms through technology transfer in joint ventures, licensing or sale of processes, training programs, and joint R&D efforts.

The variety of collaborative programs that can be designed by ISTC need be limited only by imagination and the program criteria that are adopted. Programs will differ according to the problems selected, the countries participating, and the institutions involved; certain basic collaborative mechanisms, however, are likely to be important:

1. Joint U.S.-MIC R&D

   Problems will be selected for which both the U.S. and MIC institutions have expertise, or for which the MIC has an appropriate environment for carrying out the work

2. Joint MIC-LIC R&D

   An analogous situation to #1 above, but between MIC and LIC.

3. R&D in MICs

   This mechanism should be used for problem areas in which MIC expertise is available, but not U.S. expertise, or in which necessary R & D can be done as well, and with substantial savings, in the MIC.

4. MIC/U.S. Training for LICs

   a. For particular technical topics, training courses could be arranged in MICs for participants from LICs. U.S.

trainers with special expertise could be part of such courses for a short time or for their entirety.

b. A second version of this mechanism would involve training courses at U.S. institutions for LIC participants, concluding with practical field work in a cooperating MIC, or U.S. training on development problems for MIC participants.

5. U.S.-MIC-LIC Workshops and Seminars

The U.S., MICs, and LICs could join together in workshops and seminars on selected development problems. The objective would be to share information and experience, clarify the nature of the problem, identify constraints and opportunities in developing solutions, and recommend appropriate follow-up action.

6. U.S.-MIC Consortia in Education and Research

Consortia could be formed of universities and research institutes with strengths in a selected problem. The corsortia could include qualified MIC institutions. Education and research programs involving overseas assisgnments for consortia faculty and graduate students could be undertaken to strengthen participating LIC institutional capability in the problem area.

7. U.S.-MIC Advisory Visits to LICs

For problems in LICs where a useful input can be made by short-term advisors (for problem identification, program design, advice on implementation, evaluation, etc.), advisory teams could be formed with specialists from both the U.S. and MICs, or invdividual advisors could be used.

8. MIC Advisors to LICs

For some LIC problem areas, the U.S. may support work in LICs through money or facilities, but may not have appropriate specialists for advisory support. In such instances MIC advisors, if available, could be used.

9. U.S. Research Grants to MICs

The U.S. could award research grants to individual research applicants or institutions in MICs as an incentive to do work on development problems. Projects would be proposed by the applicant and could be reviewed by a grants panel of appropriate specialists with experience in developing countries. Research topics would be required to bear on problems of low-income people or countries.

10. Orientation/Consulting Visits

Orientation visits could be arranged for administrators, researchers, or other specialists from MICs to visit relevant institutions in the U.S. for updating on recent work in their field of responsibility, for lecturing, or for consultation on collaborative projects or other ongoing work. Similar arrangements could be made for visitors from LICs to MICs or the U.S.

The preceding collaborative mechanisms certainly are not the only ones that are suitable, and it must be reemphasized that many programs will involve combinations of mechanisms. It is easily conceivable, for example, that a U.S.-MIC-LIC workshop (mechanism 5) would identify the basic aspects of an LIC problem and chart a course of action designed to develop solutions. The course of action might involve ongoing activities such as U.S.-MIC cooperative research (mechanism 1), periodic visits to the LIC by U.S. and MIC advisors (mechanism 7), and U.S. training for LIC personnel followed by field work in the MIC (mechanism 4 b).

General Program Principles

With regard to U.S. human resources, program mechanisms should be designed in ways that will encourage maximum participation by members of the scientific and technological communities. This implies the need to choose problem areas and programs after thorough consultation with reputable specialists and institutions. It implies the need to find ways of providing participants reasonable assurances of continuity of program support, to design methods of participation that enable scientists and technical personnel to maintain their professional standing, and to ensure that the professional skills of the participants will be used as fully as possible. A further implication is that collaborative programs should be

assessed regularly and objectively by evaluators not directly involved with the activities, and that there be a genuine willingness to act on the results of assessments.

Equal care and sensitivity must be given to the aspirations and constraints of MIC and LIC collaborators. Interest in collaboration should not be the result of undue persuasion or financial incentives. The interests of U.S. participants should not be such a dominating factor in the relationship that MIC or LIC concerns are pushed aside. An attitude should be conveyed that emphasizes a goal of developing long-term cooperative ties rather than simply seeking quick program results for political or bureaucratic expediency.

Novel ways should should be found to use able senior scientists and engineers in programs with MICs and LICs; many who are in the early years of retirement are vigorous and would be willing to accept short assignments abroad. The experience and judgement of senior people could be employed in interesting combinations with the drive and enthusiasm of younger researchers and students. This is an area in which the experience of the International Executive Service Corps (IESC) is especially relevant.

Finally, program mechanisms should be sought that will provide ways of involving a sizeable number of young U.S. scientists and technologists with developing countries. In a time when the United States' direct role abroad seems to be diminishing and when foreign aid budgets are thin, it frequently is very difficult for interested young people to find ways to gain overseas experience. For all the reasons that relate to global problems and increasing interdependence, this experience gap represents future problems for our country. ISTC can provide an important side benefit to

our own interests if it helps expose a younger generation to the realities of development needs and provides them with opportunities to develop relevant skills and experience.

Program Content and Funding

This final section of the report will explore some ideas and suggestions on the content and the funding of ISTC-supported programs of collaboration between the U.S. and MICs on problems of concern to the low income countries.

It is beyond the scope of this document to propose a whole range of U.S.-MIC activities in problem areas of concern to ISTC. Ideas are not lacking, however; in addition to the work done by the ISTC Planning Office, literally hundreds of suggestions have been advanced in the process of preparations for the UNCSTD. In an effort to classify and order proposals for possible U.S. initiatives at UNCSTD, a State Department report[14] considered about 500 proposals from workshops, conferences, and studies. Many of these are relevant to ISTC-sponsored collaborative activities.

The purpose of the suggestions here is to illustrate ways in which some of the program mechanisms described earlier can be applied to collaborative initiatives in ISTC program areas and to address several related aspects of their cost. The illustrations used will be based on the kind of activities suggested in the ISTC Planning Office Summary Report of March 1, 1979, or initiatives suggested in the National Academy of Sciences report on possible U.S. inititives related to UNCSTD.[15] Different illustrations could be chosen, of course, and many other programs besides these will be applicable and will be needed for the problem areas.

1. Increasing Agricultural Productivity and Rural Income

The program aims at the reduction of postharvest food losses in low-income country X. A workshop is held with postharvest specialists from the U.S., India, the Philippines and Country X to identify major foods in which local losses occur and to design a broad loss reduction program proposal.

In the next phase, research is carried out to gather specific data on the extent of losses in the foods selected by the workshop, and where losses occur in the postharvest food system; the research is supervised by an Indian postharvest specialist loaned to the Agriculture Department of Country X for one year. American, Philippine, and Country X graduate students perform the field work.

After the research is completed, another workshop is held with participants from the four countries to recommend specific policies and actions to reduce food losses, based on information from the research project. Some of the recommendations involve changes in food handling and transportation practices. Development of a better bulk container for transportation of a particular food is needed. It is decided that the work will be done through a contract with a research institute in India, with provision for collaboration from a food specialist at the agricultural university in Country X.

The organizational costs of the initial workshop are provided by ISTC, with local costs covered by Country X. In the research project, local costs are provided by Country X while India, ISTC, and the Philippines provide the salary and travel costs of the research supervisor, two American, and two Philippine graduate students, respectively. A proposal for contract development of a new kind of food container is submitted to AID for possible funding through the Country X assistance program.

2. Energy Planning and New Energy Supplies

The program objective is to train a nucleus of scientists, engineers, and social scientists from developing countries in analytical and planning techniques in order to give governments a capability for national energy planning.

Graduate courses in energy planning are established at universities in Nigeria, Malaysia, and Mexico with fellowships available to students from countries in each of the three regions. An energy education consortium is formed representing three American universities and one research institute, plus the three participating MIC institutions. Each MIC institution receives two postdoctoral teachers/researchers annually from other members

of the consortium, and two senior staff members from each participant in the consortium are available for up to four weeks travel each year to present seminars, review research projects, etc.

The consortium establishes a network to exchange information regularly on research and teaching activities. An outreach-to-industry program is organized by one of the MIC members, offering short energy planning courses to industrial managers and brief seminars on topics such as industrial energy conservation techniques.

Planning costs for establishing the three university graduate courses are provided by ISTC, which also provides costs for the information exchange and the travel of senior American staff members. Costs of postdoctoral fellows and faculty of the graduate courses are provided by the three MICs. The industrial outreach program is supported largely by fees from the participating companies, plus a small foundation grant.

3. Environmental Protection and Natural Resource Management

The program objective is to alleviate severe erosion problems in tropical Country X and to provide for a more plentiful supply of wood for domestic fuel.

A three-person advisory team, composed of members from the U.S., Brazil, and the Philippines visits Country X and suggests projects for trial plantings of several fast-growing tree species. The team agrees to help evaluate the trials through periodic visits over several years.

Meanwhile, a team of Country X graduate students and Peace Corps Volunteers, supervised by an economist in the government economic planning office, designs and carries out a survey of rural and urban household fuel use.

A specialist from Korea vists Country X to discuss Korea's experience in the organization of major reforestation projects. Costs of the consulting team are covered by ISTC. Trials of various tree species are supported by Country X, as are costs of the household fuel use survey. Peace Corps Volunteer costs, of course, are covered by the Peace Corps. Travel of the Korean specialist is paid by the Korean Government.

When growth trials and fuel use surveys are completed and analyzed, Country X plans to begin the design of a major reforestation program. The World Bank has expressed support in principle for the program.

4. Capacity Building in Science and Technology

Country X wishes to strengthen its planning capabilities in

science and technology and to build up more technology-based industry.

Officials of Country X's Ministry of Industry, the Ministry of Education, Culture, and Technology, and the Economic Planning Administration make a study/observation tour of Brazil, India, Indonesia, Taiwan, and Korea. They visit a variety of institutions including Korea's Ministry of Science and Technology, Korean Institute of Science and Technology, and Industrial Advancement Administration; Taiwan's National Science Council, Hsinchu Science Industry Park, and Joint Commission on Rural Reconstruction; Indonesia's Ministry of State for Research and Technology, and Institute of Technology, Bandung; the Department of Science and Technology in India, Indian Institute of Technology, Kanpur, and Central Leather Research Institute, Madras; and in Brazil the Institute of Polymer Chemistry of the University of Rio de Janeiro, the University of Sao Paulo and the Institute of Engineering Sciences of the State of Sao Paulo, and the National Research Council (CNPq).

After the study visit, the Country X officials draft a science and technology chapter and budget for the next five-year plan. A U.S. team of five government, academic, and industrial members visits Country X for two weeks to review the plan and suggest amendments or additions.

Travel costs of the study tour are borne by Country X, with some local hospitality from the MICs. Costs of the review team are covered by ISTC.

5. Improving Health Conditions

In poor countries, immunization and chemotherapy for tuberculosis have had limited positive results, for reasons not yet clear. The program objective is to evaluate alternative immunologic agents and determine the factors responsible for past failures, and to devise better tuberculosis treatment through bactericidal drugs and mono-specific sensitive skin tests, and improved program management techniques.

Coordinated research and testing programs are established at biomedical institutes in Mexico, Pakistan and Egypt. Data are shared among the institutes, which also receive relevant U.S. research information through an arrangement with the National Institutes of Health. An annual research conference is arranged by the NIH to exchange detailed information, discuss progress, and plan future research activities. The ISTC supports 50% of the tuberculosis research program costs at each institute, with an understanding that after five years ISTC support will end.

The five program suggestions just outlined are an attempt to illustrate the concept of how various program mechanisms can be combined in an

approach to a particular problem. Similarly, they show how the expertise or funding support of various U.S. institutions might be brought together, with ISTC acting as the catalytic agent.

The concept of U.S.-MIC-LIC collaboration is not one that is applicable only to the ISTC, of course. The same ideas and mechanisms have considerable application to other U.S. government agencies with technical assistance concerns for developing countries.

As noted earlier in the report, ISTC will have to rely on careful selection of problems, sound program design, and combinations of technical and financial support for its programs in order to obtain the greatest effect from rather modest amounts of money. For use in direct programs involving U.S.-MIC-LIC collaboration in science and technology, it seems reasonable to estimate that about 10% of the transferred $66 million from AID could be used for collaborative activities within the context of the ongoing programs. The $25 million of unprogrammed money represents an opportunity to initiate new collaborative programs built around ISTC's problem areas; a conservative approach that would allow significant sums to be used without overly committing resources to this single broad direction would be to use 20% -- or $5 million -- to initiate direct collaborative programs. This percentage allocation of uncommitted ISTC funds to U.S.-MIC-LIC collaboration might remain a useful guideline until the results of initial programs can be assessed and until Congressional attitudes toward ISTC's work become more clear.

Cost-sharing should be a fundamental tenet of collaborative programs involving MICs. This principle helps gauge the level of interest in a program, can help keep U.S. participation from being unduly dominant, and

can serve as the tangible measure of whether MICs are being stimulated to provide more technical assistance to low-income countries.

Possible ISTC guidelines for cost-sharing in U.S.-MIC-LIC programs would include the following:

- Each participant in a collaborative program should normally bear some portion of the costs, whether in services, facilities, or direct program expenditure.
- If programs involve direct expenditures in MICs, ISTC will bear no more than 50 percent of direct program costs.
- If programs involve direct expenditures in LICs, ISTC will bear no more than 75 percent of direct program costs. . (For purposes of these guidelines, those countries classified here as MICs but with per capita GNP under $500 will be treated as LICs.)
- ISTC will not normally provide financial support to any collaborative program for more than five years.
- ISTC will not expend more than 20 percent of the total funds for collaborative programs on any single program in any single year.
- ISTC will normally pay no salary costs in collaborative programs for other than U.S. citizens or permanent residents, or for consultants.
- Local costs for workshops, seminars, or conferences will be provided by the host country.
- International travel costs for participants in collaborative activities will be provided by the sending country.
- If collaborative programs are likely to lead to ongoing implementation costs beyond five years, or to capital expenditures, then ISTC will encourage early coordination with possible funding organizations.

Conclusion

A world of growing population and expanding human settlement is being severely strained. The continued accessibility of resources that once seemed infinite can, in some cases, be counted in decades. Economic growth is now seen as a mixed blessing which often creates problems that affect people's lives as severely as the problems of poverty.

Global interdependence is a fact of modern life that demands serious international effort in working together towards solutions to the problems that face every nation. We live in a constantly-changing environment. "Development" is a continuing journey, not a destination, and the journey requires continuing adjustments to an ever-changing scene.

It has become clear that there are no "technological fixes" that will quickly reverse the big and complex problems facing the world. Instead, careful attention will have to be given to making as many small advances as possible, making good decisions about the priorities of many needs, and taking care to cause the least possible disruption to resources that are the mortar binding together our societies and our lives.

The concept of increasing the flow of scientific and technological interaction between the U.S., the MICs, and the LICs is timely:

- Many global problems involve scientific or technological aspects.
- The MICs and LICs are intensely interested in building their scientific and technological capabilities.
- Science and technology are areas of special U.S. strength.
- Collaborative programs using MIC resources can help solve LIC problems while building scientific and technological capabilities both in MICs and LICs.
- Programs that are genuinely collaborative can help relieve fears developing countries may have about U.S. domination.

Scientific and technological cooperation is a necessity that must be pursued through as many channels as possible. The middle income countries have important experience to share with the low income countries and also with the United States. The ISTC should use every opportunity to put their capabilities to work.

REFERENCES

[1]Development Coordination Committee, Development Issues: U.S. Actions Affecting the Development of Low-Income Countries: The Third Annual Report of the President Transmitted to the Congress April, 1978. (Washington, D.C.: The Development Coordination Committee, 14 April 1978), p. 8.

[2]ILO International Labour Office, Employment, Growth and Basic Needs: A One-World Problem (New York: Praeger Publishers for Overseas Development Council in cooperation with ILO, 1977), pp. 15-19.

[3]Ad Hoc Committee on the International Development Institute, The International Development Institute (Washington, D.C.: National Academy of Sciences, 1971), p. 11.

[4]Panel of the Board on Science and Technology for International Development, The Future of U.S. Technical Cooperation with Korea (Washington, D.C.: National Academy of Sciences, 1969), p. 1.

[5]Study Team on Technical Cooperation with Iran, Technical Cooperation with Iran: A Case Study of Opportunities and Policy Implications for the United States (Washington, D.C.: Agency for International Development, 1972), p. 26.

[6]Ibid., p. 27.

[7]Walter J. Levy, "A Warning to the Oil Importing Nations," Fortune, 21 May 1979, p. 49.

[8]Overseas Development Council, The United States and World Development: Agenda 1979, by Martin M. McLaughlin and other staff (New York: Praeger Publishers, 1976), pp. 202-203.

[9]United Nations, Report of the United Nations Conference on Technical Cooperation Among Developing Countries: Buenos Aires, 30 August to 12 September 1978 (A/CONF. 79/13/Rev. 1), 1978, p. 3.

[10]China Publishing Company, China Yearbook 1978 (Taipei, Taiwan: China Publishing Company, 1978), p. 3.

[11]Cho Kyung Mok, Korean Science Attache, private communication, 12 May 1979.

[12]ILO., Employment, Growth and Basic Needs, pp. 125-130.

[13]Korea Development Institute, Korea's Economy Past and Present (Seoul: Korea Development Institute, 1975), pp. 280-283.

[14]United Nations, Report of the U.N. Conference on TCDC, pp. 3-4.

[15]Overseas Development Council, Agenda 1979, pp. 9f.

[16]Institute for Scientific and Technological Cooperation Planning Office, Institute for Technological Cooperation Planning Office: Summary Report (Washington, D.C.: Institute for Scientific and Technological Cooperation Planning Office, 1 March 1979), p. 3.

[17]Ibid., p. 1.

[18]Ibid., p. 2.

[19]Overseas Development Council. Agenda 1979. pp. 156-163.

[20]National Academy of Sciences -- National Academy of Engineering, The Role of U.S. Engineering Schools in Development Assistance (Washington, D.C.: National Academy of Sciences -- National Academy of Engineering, 1976), p. 12.

U.S./MIDDLE-INCOME COUNTRY ECONOMIC DEVELOPMENT RELATIONSHIPS

An Annotated Literature Review of Selected Studies and Reports

BIBLIOGRAPHY CONTENTS

I. DOCUMENTS AND OTHER LITERATURE WITH GENERAL, BUT DIRECT RELEVANCE TO THE PRINCIPLES, AIMS AND GOALS OF THE INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL COOPERATION (ISTC).

A. Classification of "middle- income" or "middle-tier" countries.

B. Consideration of U.S. relations with the "middle-tier" countries in general.

1. By U.S. Government and its agencies

2. By other sources

C. International interest in technical cooperation as expressed in various international documents.

1. United Nations "TCDC" documents

2. "UNCSTD" papers

3. Other United Nations documents

4. Other groups speaking with non-U.S. perspective

D. Specific case studies.

1. Brazil

2. Iran

3. Korea

4. Taiwan

II. LITERATURE DEALING SPECIFICALLY WITH THE PROPOSED ISTC

A. The concept and formation of an ISTC.

B. Infrastructure and resources useful to the functioning of ISTC.

I. DOCUMENTS AND OTHER LITERATURE HAVING GENERAL, BUT DIRECT RELEVANCE TO THE PRINCIPLES, AIMS AND GOALS OF ISTC:

A. Documents pertaining to the classification of "middle- income" or "middle-tier" countries.

United Nations. Economic and Social Council. Committee for Development Planning. Eleventh Session, 6 March 1976. Identification of the Least Developed Among the Developing Countries: A Review in the Light of Recent Information [Paper prepared by the Secretariat] E/AC.54/L.72.

Criteria and indicators used in identifying the "least-developed" among the developing countries -- and hence, the "more-developed" among the developing countries -- are given, based on economic and social characteristics. Table I, p. 8, places countries in four major groups based on economic development and literacy ratio, and lists statistical data for each of the five principle social and economic indicators used.

United Nations. General Assembly, Committee on Contributions, Official Records, Thirty-Second Session, Supplement No. 11, 1977. Report of the Committee on Contributions (A/32/11).

Reference is made to Annex VI, pp. 91-94. Here the U.N. member countries are listed and identified as being among the "Group of Seventy-seven," or classified by various U.N. agencies and the World Bank as "least-developed" and "most seriously affected" countries, UN "developing countries," and World Bank "developing countries".

The World Bank. 1978 World Bank Atlas: Population, Per Capita Products, and Growth Rates. Washington, D.C.: The World Bank. 1978.

The World Bank Atlas contains estimates of population, gross national product (GNP), and per capita GNP in current U.S. dollars for most countries of the world for the year 1976. The Annex also includes estimates of per capita product in current U.S. dollars for the years 1975, 1976, and 1977 for the Bank's members and countries having a population of one million or more.

B. Consideration of U.S. relations with the "middle-tier" countries in general.

1. By U.S. Government and its agencies

Agency for International Development. Bureau for Program and Policy Coordination. A Strategy for a More Effective Bilateral Development Assistance Program. Washington, D.C.: Agency for International Development. March 1978.

This policy-review document was first drafted in the summer of 1977 to serve as a backgound paper on bilateral development assistance for the President's Development Coordination Committee (DCC) Foreign Assistance Study (October 1977). The current version has been expanded to take into account comments from other AID bureaus and USG agencies. It discusses technical assistance exchange by programs, and includes a section specifically on middle-income countries (p. 37).

Agency for International Development. Bureau for Technical Assistance. Office of Special Technical Services. Benefits to the United States from American Technical Assistance Activities Abroad: Some Case Studies. Washington, D.C.: Agency for International Development. 1 December 1972.

This A.I.D. report analyzes 200 projects, of which 76 were found to have produced some benefit to the United States. All 200 projects are categorized by type of project, their aim and objectives enumerated, and benefits to the U.S. identified and analyzed. This study might have relevance to identifying types of projects feasible with limited funds.

Agency for International Development. Program Policy Coordination. Operational Appraisal Section. Technology Exchange and Cooperation. A Program Proposal. [By James L. Roush, internal document for A.I.D.] Washington, D.C.: Agency for International Development. 13 April 1978.

This study contains much background on middle-income nations and proposes a new AID relationship to them.

Agency for International Development. Office of Science and Technology, Technical Assistance Bureau. Information on the Office of Science and Technology and Its Programs (TA/OST 75-25). Washington, D.C.: Agency for International Development. February 1975.

This paper discusses U.S. policy concerning aspects of science and technology exchange, as well as compiling a list of relevant documents published by A.I.D. from that office (OST). The section on policy specifically discusses "Non-AID and 'Graduate' Countries" (p. 8). Section 8 identifies S&T development-capability networks and institutions in countries (Asian, in particular) now deemed "middle-tier."

Battelle Columbus Laboratories. Some Considerations on Transfer of Technology to Developing Nations. [Submitted to National Science Foundation. Science and Technology Policy Office by Samuel Globe and Herbert S. Kleiman]. 19 September 1974.

This is an overview study of technology transfer to developing countries. Included are some examples of projects that worked and some that failed (all are in "middle-income" countries -- pp. 38 and 41-43). On the whole, the report is general; but it does have useful application to an organization such as ISTC.

Development Coordination Committee. Development Issues: U.S. Actions Affecting the Development of Low-Income Countries. Annual Report(s) of the President Transmitted to the Congress. Washington, D.C.: Department of State, Agency for International Development. May 1975; April 1978.

All three Presidential reports thus far submitted deal directly with U.S. policies and initiatives -- as well as assessment of the international scheme affecting development of the low-income countries. This includes North-South dialogue, trade relations, financial exchange, as well as specific problem areas. All have direct relation to the development of middle income countries; and the Third Annual Report has a specific section dealing with "The Middle Income Countries -- MICs" (p. 8).

Develoment Coordination Committee. (Title Unknown.) [Internal government study]. Washington, D.C.: Development Coordinating Committee. March 1979.

This study recommends a largely broadened mandate for AID to handle continued relations with the "graduate nations."

National Academy of Sciences. National Academy of Sciences: International Development Programs of the Office of the Foreign Secretary. Summary and Analysis of Activities, 1961-1971. [Prepared for the Board on Science and Technology for International Development and the Agency for International Development by Harrison Brown and Theresa Tellez]. Washington, D.C.: National Academy of Sciences. May 1973.

This book does not deal with ISTC per se. However, it is so useful it is also listed in Section II, under documents pertaining directly to ISTC. Intended for internal evaluation by N.A.S. and A.I.D., it gives a summary of development activities undertaken by the National Academy of Sciences, including countries that are now all designated as "middle-tier".

While the summary and analysis covers a period eight to eighteen years ago, it is valuable as a historical analysis in helping to understand the development process in 12 Latin American and Asian middle-tier countries have become such. It lists special studies and projects undertaken in these countries -- as well as the important resource people used in connection with the projects -- and, therefore, developed infrastructure possibly available for use in ISTC future projects. All in all, it is felt this could be a useful document of resource information for ISTC, both in general, and dealing with specific middle-tier countries.

National Academy of Sciences. Office of the Foreign Secretary. The International Development Institute. [A Report of an Ad Hoc Committee of the Board on Science and Technology for International Development]. Washington, D.C.: National Academy of Sciences. July 1971.

The Ad Hoc Committee considered the character, purposes, and functions of the IDI, formerly proposed by President Kennedy in 1979, emphasizing the exchange of science and technology as a key to the problems of development. This document has relevance to the currently proposed ISTC in that many of the functions and goals discussed in it are still currently applicable, and it discusses the need for and mechanisms necessary to continue relations with current middle-income countries, such as Korea and Taiwan.

National Bureau of Standards. The Technological Knowledge Base in Industrializing Countries NBS Special Publication 543. Washington, D.C.: National Bureau of Standards. April 1979.

This is the proceedings of a seminar on the industrialization of developing countries, jointly sponsored by NBS, AID, and the Office of the U.S. Coordinator for UNCSTD.

National Research Council. 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 of Science and Technology for Development, Vienna, 1979. Washington, D.C.: Department of State. 1978.

This book deals with the transfer of science and technology by specific areas of concern for use in the 1979 UNCSTD Conference. It highlights suggested changes in U.S. policy and new initiatives to be considered. It is as applicable and important to the further development of the middle-income countries, as it is to the lesser-developed countries.

United States Bilateral Science and Technology Agreements: A Policy Review. Report of the Ad-Hoc Panel on the Review of Bilateral Science and Technology Cooperation. [Panel chaired by State Department and submitted to the White House Office of Science and Technology Policy, Federal Coordinating Council for Science, Engineering, and Technology]. Washington, D.C.: The State Department. January 1979. (Classified Document, not available for general distribution.)

This document is a comprehensive analysis and policy review of all existing bilateral agreements that the U.S. government has with all countries, ranging from and including the "developed and industrialized" to the "least developed." The report makes recommendations on how to improve these agreements in order to foster improved relations with each particular country. (This is a product of an inter-agency study. State Department contact: Mr. William Long, OES, 632-2418.)

United States House of Representatives, Committee on International Relations, and United States Senate, Committee on Foreign Relations. Legislation on Foreign Relations Through 1977: Current Legislation and Related Executive Orders. Vol. 1. Joint Committee Print. Washington, D.C.: U.S. Government Printing Office. February 1978.

This is the composite of all existing legislation and executive orders applying to foreign relations. Sections are broken down by (A) Foreign Assistance, (B) Agricultural Commodities, (C) The Peace Corps,

(D) Arms Control and Disarmament, (E) Department of State, (F) Information and Education and Cultural Exchange Programs.

2. By other sources

Arnold, Henry. "Some Emerging Modes of Technology Exchange in the U.S. Foreign Assistance Program." in The Application of Technology in Developing Countries, Robt. L. Bulfin, Jr. and J. Richard Greenwell, eds. [Papers presented during an Interdisciplinary Programs Seminar Series, August-December 1976]. Tucson: The University of Arizona. 1977.

This volume presents papers dealing with the exchange of technology with developing countries. The papers are divided into sections concerning "low-level" technology and "high-level" technology. Mr. Arnold, formerly of A.I.D. (OST) addresses the spectrum of U.S. foreign technical assistance, and specifically discusses the vital need to maintain "...long-standing and often hard-won economic and technological relationships with countries now considered to be in the middle income category. We need to maintain association with them we need to pull them into the world effort to assist the poorer countries,..." (p. 160). The article, and indeed, the entire volume is relevant to the goals of ISTC.

Council on Science and Technology for Development. Legislative Basis for United States Bilateral Cooperative Arrangements in Science and Technology with Middle Income Developing Countries [by Daniel F. Margolies]. Washington, D.C.: Council on Science and Technology for Development. 6 February 1978.

Mr. Margolies presents an entire range of ideas on the subject of continuing relations with middle-income countries. His "Table of Contents" includes:

"(1) Definition of Middle Income Developing Countries..."

"(2) United States Lack of Policy for Technical Cooperation with" (MICs)

"...(3) Legislative Authority for U.S. Government Agencies...to conduct Technical Activities in" (MICs)

"...(7) The Ambiguous Role of AID in Dealing with" (MICs)

"...(10) Key Issues to be Addressed in Strengthening Linkages Between The United States and" (MICs)

Development World Industry & Technology, Inc. North/South Transfer of Technology: What Realistic Alternatives Are Available to the U.S.? Progress Report No. 2: Colombia [for U.S. Department of State].

Washington, D.C.: Developing World Industry & Technology, Inc. 30 December 1976 (Draft copy).

This research project report discusses transfer of technology from the U.S. to Colombia to meet that country's priority needs as well as to fulfill U.S. policy objectives. New and proposed institutional arrangements by the U.S. and by international organizations and world bodies are discussed. Special emphasis is placed on the DEWIT enterprises as well as the experience of the Japanese Institute for Transfer of International Technology. Of particular importance to ISTC is a section identifying Colombian resources for technology exchange, with evaluations (Appendix B).

Fund for Multinational Education, Council of the Americas, U.S. Council of International Chamber of Commerce, The George Washington University. Public Policy and Technology Transfer: Viewpoints of U.S. Business. [for the State Department.] Washington, D.C.: The State Department. March 1978.

This is a rather thorough discussion on transfer of technology through both the U.S. government and the private sector to the developing world. Specific sections are devoted to countries considered "middle-tier" (such as Brazil, Mexico, India, Iraq, etc.), as well as to the LDCs. Consideration is given to the coming UNCSTD conference and role of multi-multinational and international organizations, as well as to specific U.S. policy.

Goulet, Denis. The Uncertain Promise: Value Conflicts in Technology Transfer. New York: IDOC/North America, Inc. and Washington, D.C.: Overseas Development Council. 1977.

This book emphasizes the social aspects of change that occur through, or as a result of, technology transfer for development. Specific case studies include Brazil, Argentina, and other middle-tier countries.

Overseas Development Council. The United States and World Development: Agenda 1979 [by Martin M. McLaughlin and other staff]. New York: Praeger Publishers. 1979.

A rather inclusive work on current North-South relations, the disparity in economic and social characteristics, and specific U.S./North-South problem issues. Statistical annexes concerning the Physical Quality of Life Index (PQLI), global poverty-affluence spectrum, trade, and other related subjects are included.

C. International interest in technical cooperation as expressed in various international documents.

1. United Nations "TCDC" documents (United Nations Conference on Technical Cooperation among Developing Countries), Buenos Aires, 30 August to Sept. 1978.

This Conference expresses the explicit need and desire of the developing countries to work collectively among themselves, through the U.N., and with the developed nations to further their capability for scientific and technological development. Middle-tier countries were also directly involved, and their desire for continued support in growth and development is made clear.

Document Symbol	Agenda Item	Title
A/CONF.79/13/Rev. 1		Report of the United Nations Conference on Technical Co-operation Among Developing Countries
A/32/42, vol. I, II, and III		Report of the Preparatory Committee for the United Nations Conference on Technical Co-operation Among Developing Countries. (General Assembly, Official Records: Thirty-Second Session, Supplement 42, vols. I and II, New York, 1977.)
A/CONF.79/PC/5	1	Provisional agenda of the Planning Committee
A/CONF.79/PC/6	2	Progress report of the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries
A/CONF.79/PC/7	2(b)	Report of the Inter-Agency Task Force for the United Nations Conference on Technical Co-operation among Developing Countries
A/CONF.79/PC/8	2(e)	Recommendations on the budget for the Conference: report of the Secretary-General of the Conference
A/CONF.79/PC/8/ Add.1	2(e)	Recommendations on the budget for the Conference: administrative and financial implications of the proposal to postpone the United Nations Conference

Document Symbol	Agenda Item	Title
		on Technical Co-operation among Developing Countries from March/April to August/September 1978
A/CONF.79/PC/9	2(c)	Draft provisional agenda for the Conference
A/CONF.79/PC/10 and Corr.1	3(b)	Consolidation and analysis of the proposals and recommendations of the regional intergovernmental meetings on technical co-operation among developing countries: report of the Secretary-General of the Conference
A/CONF.79/PC/11	3	Guidelines for the preparation of national reports: note by the secretariat
A/CONF.79/PC/12	3(b)	Technical co-operation among developing countries as a new dimension of international co-operation for development: an outline

The final version of this (which is basically identical to the Preparatory Committee document) is identified as A/CONF. 79/6-5 July 1978. In it is an excellent and thorough background overview on the need for a TCDC Conference, describing the current world setting and giving TCDC objectives and concept. Then 15 specific problem areas and examples of application of technical cooperation among developing countries are described, including population, health, natural resources, etc.

A/CONF.79/PC/13	3(b)	A questionnaire on sources and methods of financing technical co-operation among developing countries: note by the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries
A/CONF.79/PC/14 and Add.1	3(b)	Measures for stimulating and strenthening consultancy, engineering and other technical services, as well as the supply and procurement of such services and of equipment and materials of developing countries, through the promotion of technical co-operation among developing countries: note by the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries

Document Symbol	Agenda Item	Title
A/CONF.79/PC/15	3(b)	Report of the Regional Intergovernmental Meeting on Technical Co-operation among Developing Countries organized by the United Nations Development Programme in co-operation with the Economic Commission for Western Asia (Kuwait, 24-29 May 1977)
A/CONF.79/PC/16	3(b)	Institutional arrangements at the national level to promote and conduct technical co-operation among developing countries: note by the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries
A/CONF.79/PC/17 and Corr.1	3(b)	Institutional arrangements at the international level to promote and conduct technical co-operation among developing countries: note by the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries
A/CONF.79/PC/18	2	Organization of the United Nations Conference on Technical Co-operation among Developing Countries - the Kuwait Declaration
A/CONF.79/PC/19	3(b)	The role of the regional commissions in technical co-operation among developing countries
A/CONF.79/PC/24	3	Draft plan of action for promoting and implementing technical co-operation among developing countries.

This is an inclusive document, providing a global perspective of the problem; giving definitions, objectives, and scope of functions and activities of TCDC; and giving recommendations on national, regional, and global levels.

A/CONF.79/PC/L.4	2(d)	Draft provisional rules of procedure of the Conference: note by the secretariat
A/CONF.79/PC/L.5	3(a)	Plan of action for promoting and implementing technical co-operation among developing countries: note by the Secretary-General of the United Nations Conference on Technical Co-operation among Developing Countries

This is the final, definitive statement as accepted by the UN Conference on Technical Co-operation among Developing Countries. Known officially as the "Buenos Aires Plan of Action," it provides an Introduction, expressing why TCDC is necessary; it enumerates Objectives of the TCDC; and it lists concrete Actions in the form of specific Recommendations to be taken by member countries.

A/CONF.79/PC/L.6	2	Preparations for the United Nations Conference on Technical Co-operation among Developing Countries: draft decision submitted by the Chairman of the Committee
A/CONF.79/PC/L.7	4	Provisional agenda for the third session of the Preparatory Committee

The national reports submitted by Governments to the United Nations Conference on Technical Co-operation among Developing Countries are being issued in three volumes according to the dates of receipt. Volume I contains the national reports received at United Nations Headquarters by 3 January 1978; volume II contains those received by 1 February 1978, and volume II, those received by 1 May 1978. Any reports received after 1 May will be issued in volume IV (A/CONF.79/NR/1/Add.3).

Volume I (A/CONF.79/NR/1)

Botswana, Burma, Chad, Comoros, Cyprus, Democratic Yemen, El Salvador, Gabon, Ghana, Iraq, Israel, Lebanon, Lesotho, Liberia, Mali, Mauritania, Mauritius, Nicaragua, Papua New Guinea, Philippines, Qatar, Rwanda, Seychelles, Sierra Leone, Singapore, Thailand, Tunisia, United Arab Emirates, Upper Volta, Uruguay and Zaire.

Volume II (A/CONF.79/NR/1/Add.1)

Afghanistan, Australia, Austria, Burundi, Central African Empire, Chile, Costa Rica, Dominican Republic, Ecuador, Egypt, Jamaica, Japan, Jordon, Kenya, Kuwait, Madagascar, Malaysia, Nepal, Oman, Panama, Paraguay, Peru, Republic of Korea, Romania, Senegal, Sri Lanka, Sudan, Swaziland, Togo, Trinidad and Tobago, Turkey, Uganda, United Republic of Cameroon, United Republic of Tanzania, Yugoslavia and Zambia.

Volume III (A/CONF.79/NR/1/Add.2)

Argentina, Bahrain, Bangladesh, Belgium, Colombia, Djibouti, Finland, France, Germany, Federal Republic of, Guyana, Honduras, India, Indonesia, Italy, Libyan Arab Jamahiriya, Malta, Mexico, Morocco, Netherlands, Pakistan, Poland, Saudi Arabia, Sweden, United States and Venezuela.

United Nations. United Nations Development Programme. TCDC News. New York: UNDP. January 1979, No. 1.

This is a non-regularly published periodical that will specialize in the exchange of technical cooperation, governmental and non-governmental, among developing countries. Articles include institutional development and S&T cooperative exchange among middle-level countries (i.e.: Brazil, India, Sri Lanka, etc.). Hence, it is relevant and has importance to ISTC.

2. "UNCSTD" papers (United Nations Conference on Science and Technology for Development), to be held in Vienna, August, 1979.

This Conference aims at fostering the integration of science and technology with the socio-economic development and strengthening of self-reliance of developing countries. It intends to focus the attention of scientists, technologists, planners, decision-makers, and administrators on the benefits of, and need for, science and technology in the development of LDCs; and it has definite implications to the development of the middle-income nations.

Document Symbol	Title
A/32/43	Report of the Preparatory Committee for the United Nations Conference on Science and Technology for Development. (General Assembly, Official Records: Thirty-Second Session, Supplement No. 43, New York, 1977.)
A/33/303	United Nations Conference on Science and Technology for Development. Draft outline of the programme of action. Note by the Secretary-General. (General Assembly, Thirty-third session, Agenda item 70.)

This document gives an introduction plus consolidated recommendations put forth at the national and regional levels.

(U.N. document numbers unassigned as of this date)	The National Papers of the member countries, outlining each member's view of its needs and capabilities for sharing science and technology with other countries.
ORG/130/1/1/CSTD	Science, Technology, and World Development: The views of UNDP. (Draft for discussion). 15 March 1979.

This paper sets out the views of UNDP (U.N. Development Programme), derived from its practical experience, on the role of science and technology in development, and it suggests lines of action through which the potential of science and technology can be more effectively utilised to enhance the progress of the developing countries. [Requested by the UNCSTD Secretary-General, this background document is to be submitted to the Preparatory Committee for the UNCSTD Conference.

U.S. Department of State. The Ordering of Proposals for Possible U.S. Initiatives to be Offered at UNCSTD. [Prepared by L. Rudel and M. Levitan (T/CST, State Dept.), S. Owens (OST/AID)]. Washington, DC: Dept. of State. 15 March 1979.

This document sets forth a comprehensive catagorized ordering of new programs or initiatives relevant to the Agenda of the UNCSTD Conference, and it identifies policies of the U.S. governments that must be reconsidered if these proposals are to be adopted. Reference is made to Annex I, which includes research projects relevant to the exchange of science and technology, with particular attention placed on middle-income nations.

U.S. National Research Council. 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 of Science and Technology for Development, Vienna, 1979. Washington, D.C.: Department of State. 1978.

This book deals with the transfer of science and technology by specific areas of concern for use in the 1979 UNCSTD Conference. It highlights suggested changes in U.S. policy and new initiatives to be considered. It is as applicable and important to the further development of the middle-income countries as it is to the lesser-developed countries. (This document was also listed in Section I, B-1.)

3. Other United Nations documents

United Nations. Office for Science and Technology. Science and Technology in United Nations Conferences. [by John M. Logsdon and Mary M. Allen.] Washington, D.C.: The George Washington University. January 1978.

Each of fourteen U.N. conferences since 1963 which have particular relevance to science and technology and their relationships to development are identified. The role of S&T transfer and its importance to LDC development is discussed. This paper has direct implications for the need for continued relations in S&T transfer to the growth of the "middle-income" developing countries.

United States Mission to the United Nations. "Remarks of Mr. Robert Hormats, Head of the United States Delegation to the first meeting of

the Preparatory Committee for the new International Development Strategy, April 3, 1979." [Press Release USUN-35(79)]. New York, United States Mission to the United Nations. 3 April 1979.

This speech discusses the need for further collaborative assistance to the developing nations. Specific target areas are discussed.

Reference to the middle-income countries and their relationship to the LDCs is made (p. 2).

4. Other groups speaking out from a non-U.S. point of view

Erb, Guy F. and Kallab, Valeriana, eds. Beyond Dependency: The Developing World Speaks Out. Washington, D.C.: Overseas Development Council. 1975.

This book contains a series of articles and personal statements of accomplished and scholarly individuals from developing countries, who comment on the need for self-reliance in an admittedly "interdependent" world and on the critical problem areas in "North-South" relations. Guy F. Erb, Senior Fellow at the Overseas Development Council and the only writer from a developed country, gives a synthesis of these statements and comments from a historical point of view of the developed world. Nongovernment as well as official statements of relevance are included in Annexes. The comments have direct bearing on the need for a continued relationship and cooperation as these countries "graduate" to "middle-income" status.

[Note: the following four documents represent a collective desire on the part of members of the Organization of American States for bilateral, regional, and inter-American transfer of technology; for greater access for monies and credit; and for a better mechanism to facilitate this transfer of technology. Resource people and institutions involved in OAS scientific and technical affairs are listed].

Organization of American States. Department of Scientific Affairs. Basis for a Program to Improve Technological Management in Industrial Enterprises. [Report of the Working Group of Experts on Technological Management]. Washington, D.C.: O.A.S. 15-19 May 1978.

Organization of American States. Department of Scientific Affairs. La Gestion Tecnologica en America Latina: Informa Final del Group de Expertos Sobre Gestion Tecnologica. Washington, D.C.: O.A.S. 15-19 May 1978. (In Spanish only).

Organization of American States. Department of Scientific Affairs. Primera Reunion de Directores de Institutos de Investigacion Tecnologica Industrial: Informe Final. SG/Ser. P/II. 1 Re. de IITI/1. Washington, D.C.: O.A.S. 25 May 1978. (In Spanish only).

Organization of American States. Department of Scientific Affairs. Proposal for an Inter-American Program of Cooperation for the Creation, Adaptation, and Transfer of Technology. OAS/Ser. T/1 TECH/doc. 31. Washington, D.C.: O.A.S. 15-19 January 1979.

Rahman, A. "End of Colonialism and the Development of Science Policies for New Nations." Journal of Scientific & Industrial Research. 37(2) 1978. Pp. 65-72.

Mr. Rahman, a member of the Council of Scientific & Industrial Research in India, expresses the view that the developed nations have exploited, taken advantage of, and benefited from "development assistance" to the lesser developed world. His views give, perhaps, insight into a need for a new direction in S&T exchange, vital to the heart of the concept of an ISTC.

World Bank. "Chapter 7: Development Priorities in the Middle Income Developing Countries" and "Chapter 8: Conclusions" in World Development Report 1978. Washington, D.C.: The World Bank. August 1978.

The World Bank discusses how to further develop and stabilize middle-income national growth through increased industrial trade, agricultural growth, and distribution of economic benefits from growth.

D. Specific case studies.

[Note: Country reports have not been annotated. They serve as case studies of "less-developed countries," which have received assistance from the International Development and have progressed to "middle-income" graduate status.]

1. Brazil

Agency for International Development. U.S. Bilateral Assistance to Brazil. Brazilia: Agency for International Development. 18 January 1979.

2. Iran

Agency for International Development. Technical Cooperation with Iran: A Case Study of Opportunities and Policy Implications for the United States. Washington, D.C.: Agency for International Development. 11 April 1972.

Agency for International Development. Communications Resources Branch. Highlights of the AID Program in Iran. Washington, D.C.: Agency for International Development. January 1964.

"Iran: A Study of Development" Near East Report: A Washington Letter on American Policy in the Near East. [Special Survey: A Supplement to the Near East Report]. January 1966.

3. Korea

Agency for International Development. Office of Science and Technology. Impact on the United States Economy of Transfers of Technology: (Pilot Program in Korea) [by John Mintzes]. Washington, D.C.: Agency for International Development. January 1973.

National Academy of Sciences. Board on Science and Technology for International Development. Office of the Foreign Secretary. The Future of U.S. Technical Cooperation with Korea. Washington, D.C.: Agency for International Development. November 1969.

National Academy of Sciences. Board on Science and Technology for Development. Staff Summary Report of Activities of the National Academy of Sciences Advisory Panel to the Ministry of Science and Technology, Republic of Korea. [for Agency for International Development]. Seoul, Korea: National Academy of Sciences. 10-21 January 1972.

4. Taiwan

Agency for International Development. Technical Assistance Bureau. Office of Development Administration. The Role of Local Institutions and Joint Organizations in Less Developed Countries as Program Intermediaries for Foreign Assistance: Case No. 2: The Joint Commission on Rural Reconstruction (JCRR) Taiwan [Prepared by E.G. Alderfer]. Washington, D.C.: Agency for International Development. July 1971.

U.S. Department of Agriculture. Eocnomic Research Service. Foreign Development and Trade Division. Taiwan's Agricultural Development: Its Relevance for Developing Countries Today. (Foreign Agricultural Economic Report No. 39). Washington, D.C.: Department of Agriculture. April 1968.

II. LITERATURE DEALING SPECIFICALLY WITH THE PROPOSED ISTC

A. The concept and formation of an ISTC.

Bergsten, Fred. C. "Economic Relations Between the United States and Brazil: A Focus on Trades" [Remarks before the Brazilian-American Chamber of Commerce, New York, 9 May 1978].

Mr. Bergsten, Asst. Secretary of Treasury, makes comments vital to the very heart of the concept of ISTC and to the principle of utilizing "middle-income" nations to help "lesser-developed" nations:

"...we regard as extremely important the principle of graduation along a continuous spectrum from least to most advanced levels of economic achievement. In the trade field, graduation involves the transition from having preferential access to the markets of others through opening up one's own markets to eventually providing preferences to less fortunate nations. In development assistance, it involves a gradual shift from receiving foreign resources and technical expertise to providing such resources to others."

Council on Science and Technology for Development. The Institute for Scientific and Technological Development: An Independent Assessment [Study Director: James Beverly]. Washington, D.C.: Council on Science and Technology for Development. May 1979.

This was an independent study financed by the Rockefeller Foundation expressing the need for and objectives and functions for ISTC.

Council on Science and Technology for Development. "Letter" [to Dr. Frank Press, Director, Office of Science and Technology Policy, Executive Office of the President by Frederick Seitz, Chairman] 21 August 1978.

In this letter to Dr. Frank Press, Dr. Seitz offers recommendations by CSTD on defining the "middle-income" concept, as well as specific factors that might be considered in developing any type of collaborative assistance program by the "Foundation for International Technological Cooperation" (FITC). Reasons that such an organization is needed are given. Attached to the letter is a list of studies and previous government experience done in collaboration with middle tier countries, compiled by Dan Margolies.

Ganley, Oswald H. "Statement" [by Deputy Assistance Secretary of State at OECD Workshop on Scientific and Technological Cooperation with Developing Countries] 10 April 1978.

On pages 5 and 6, Secretary Ganley talks specifically of the need for the U.S. to have "a new entity within the foreign assistance agency ...an institutional framework for research and development, and for technical assistance specifically aimed at applying science and technology, and at helping developing countries..." He further laments "...the rather limited set of programs for cooperating with the middle and upper tier countries in science and technology...."

Hesburgh, Theordore M. "Helping the Developing Nations to Help Themselves." The New York Times. 24 March 1979. Pg. 3.

Mr. Hesburgh, president of Notre Dame University, will head the American delegation to the UNCSTD Conference in Vienna this August. His article discusses the need for an "Institute for Technological Cooperation" in American policy and in world development needs. He specifically discusses the need for middle-income nations to have continued access to American expertise for further development.

Overseas Development Council. The Emergence of the Advanced Developing Countries [by John A. Mathieson]. Washington, D.C.: Overseas Development Council. (in preparation).

This is an excellent paper by Mr. Mathieson, whose purpose is to identify the current set of ADC's ("advanced developing countries") and to establish a rationale for distinguishing this particular set of countries. This is followed by a brief description of the development experience of these countries, in which he uses Hong Kong, Singapore, South Korea, Taiwan, Brazil, and Mexico as specific examples to discuss in detail. The next section examines how their domestic conditions and international transactions affect the economies of the industrialized nations, and in particular the U.S. Finally, he turns to policy implications that must be faced by countries of the North, countries of the South in general, and by the "ADC's" themselves.

Rowen, Hobart. "New U.S. Foundation Planned to Assist Third-World Nations." The Washington Post. 7 September 1978. Pg. A-20.

Mr. Rowen discusses the need for a "Foundation for International Technological Cooperation," what its purpose and function will be, and how it will relate to the desires expressed in the UNCSTD and UNCTAD Conferences. Specifically mentioned is how middle tier countries, including Mexico, Korea, and Iran, are now cut off from normal aid programs by their relative prosperity.

B. Infrastructure and resources useful to the functioning of ISTC.

Agency for International Development. Office of Science and Technology. Appropriate Technologies for International Development: Preliminary Survey of Research Activities TA/OST 72-11. Washington, D.C.: Agency for International Development. September 1972.

This study is useful in that it identifies science and research firms in middle-income countries of Asia, Latin America, and Africa (pp. 15-21), as well as discussing specific technical capabilities in several middle-income nations (Brazil, Taiwan, Argentina, Korea) beginning on p. 46. A third section addresses multinational corporations and their involvement in adaptive research for developing countries.

Agency for International Development. Office of Science and Technology. Research Interests of Foreign Assistance Agencies Concerning Appropriate Technology AID/TA/OST PN-AAC-407. Washington, D.C.: Agency for International Development 1972.

This booklet lists specific national and regional institutions having research capabilities in Africa, Asia, and Latin America that could be of use to ISTC (pp. 34-37).

Agency for International Development. Office of Science and Technology. Technical Assistance Bureau. Information on the Office of Science and Technology and Its Programs (TA/OST 75-25). Wahsington, D.C.: Agency for International Development. February 1975.

Please see annotation in Section I, B-1.

Development World Industry & Technology, Inc. North/South Transfer of Technology: What Realistic Alternatives Are Available to the U.S.? Progress Report No. 2: Columbia [for U.S. Department of State]. Washington, D.C.: Developing World Industry & Technology, Inc. 30 December 1976 (Draft copy).

Please see annotation in section I, B-2.

National Academy of Sciences. National Academy of Sciences: International Development Programs of the Office of the Foreign Secretary. Summary and Analysis of Activities, 1961-1971. [Prepared for the Board on Science and Technology for International Development and the Agency for International Development by Harrison Brown and Theresa Tellez]. Washington, D.C.: National Academy of Sciences. May 1973.

United Nations Development Programme. Directory of Services for Technical Cooperation Among Developing Countries. New York: UN Development Programme. 1977, No 1. 563 pp.

This is an excellent and inclusive work. It is a directory of services offered by developing countries to other developing countries. Data is supplied by more than 850 organizations in 67 developing countries (including middle-income), 31 regional organizations, and 8 organizations of the U.N. system.

The directory lists services that the organizations could furnish in the following areas: (1) education and training, (2) research and technological development, (3) expert and (4) consultancy. In addition, information published by them and/or about the first four services is also listed (including books, periodicals, computer printouts, etc.).

United Nations Educational, Social and Scientific Organization. Results of a survey of research institutions and laboratories in selected developed countries which have been concerned with research on problems of developing countries. Unesco/NS/ROU/376. Paris: Unesco, 1976. 194 pp.

This lists data bases and research institutions in selected developed countries and supplies addresses for them. More appropriately, it also lists the specific projects in developing countries, that these institutions are (or have) undertaken and who or what division of the research institution is responsible for them.

Volunteers in Technical Assistance (VITA, Inc.) Appropriate Technology in Latin America [Prepared for Agency for International Development. Written and compiled by Richard J. Fera and Maria Elena Dubourt]. Mt. Ranier, Md.: Volunteers in Technical Assistance. April 1976.

This survey lists, by country, resource persons, groups, and institutions available in Latin America that are in some way involved in technological development and/or exchange. As it includes even Peace Corps volunteers serving at that time, its timeliness may be questionable in some instances.