

AGENCY FOR INTERNATIONAL DEVELOPMENT WASHINGTON, D. C. 20523 BIBLIOGRAPHIC INPUT SHEET	FOR AID USE ONLY
---	-------------------------

1. SUBJECT CLASSIFICATION	A. PRIMARY Development and economics	DA00-0000-GG30
	B. SECONDARY General--Near East	

2. TITLE AND SUBTITLE
 Regional cooperation in the Middle East

3. AUTHOR(S)
 (101) AID/NE

4. DOCUMENT DATE 1979	5. NUMBER OF PAGES 158p.	6. ARC NUMBER ARC NEA338.91.A265
---------------------------------	------------------------------------	--

7. REFERENCE ORGANIZATION NAME AND ADDRESS
 NE

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)
 (Prepared in response to a request from the Conference Committee on the Int. Security Assistance Act of 1978) (Based on AID-commissioned studies by government agencies, private firms, and individual contractors)

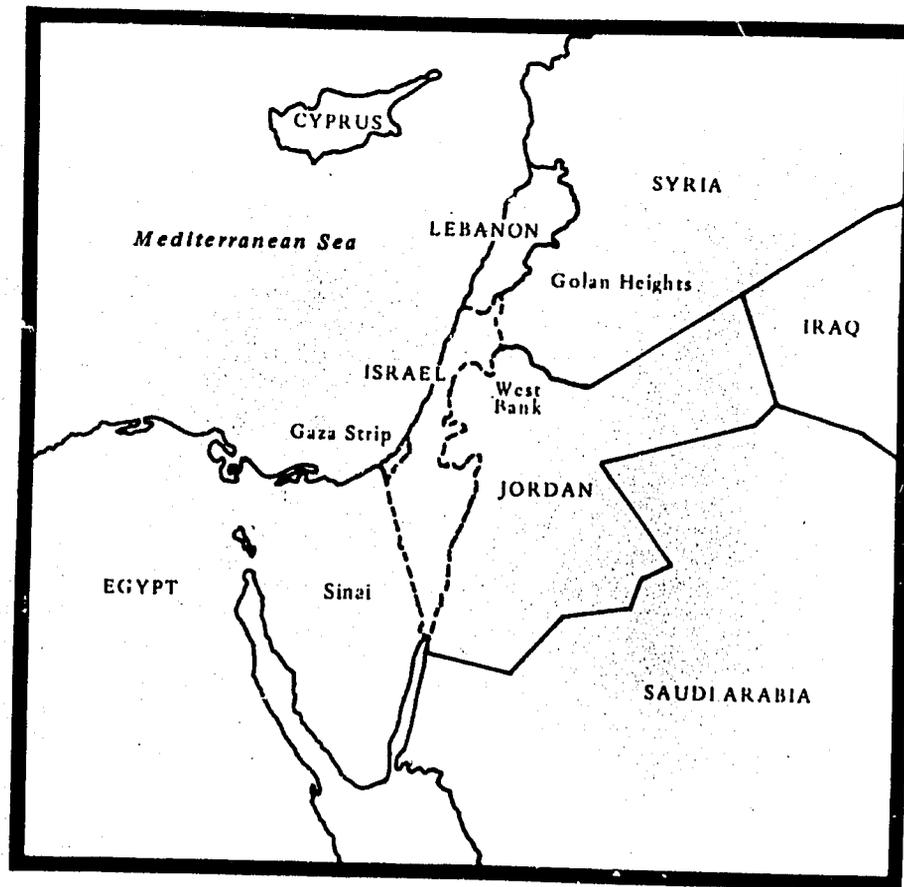
9. ABSTRACT

10. CONTROL NUMBER PN-AAG-610	11. PRICE OF DOCUMENT
12. DESCRIPTORS Regional planning International cooperation Projects Science and technology Transportation Telecommunication	13. PROJECT NUMBER
	14. CONTRACT NUMBER NE
	15. TYPE OF DOCUMENT
Industrialization Energy Water resources Tourism Arab countries Near East	

NEA
33891
A265

PN-AG-61E

Regional Cooperation in the Middle East



February 1, 1979

Agency for International Development
Department of State

PREFACE

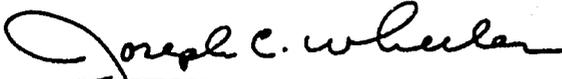
This report was prepared in response to the following request from the Conference Committee on the International Security Assistance Act of 1978 (Report No. 95-1546):

"The committee of conference noted that the executive branch supports the encouragement of activities which might lay the base for programs of regional significance in the Middle East in support of the peace process and that it currently has underway studies of possible regional projects and cooperation. The committee requests that the executive branch report to the Congress not later than February 1, 1979, on the results of its studies. The committee also requests that the executive branch include in its studies those programs which stress economic development and scientific or technical cooperation."

In order to assess the prospects for regional cooperation in the Middle East, A.I.D. commissioned eight government agencies and ten private firms and individuals to evaluate the potential for cooperation in various sectors. These individual studies were drawn upon in preparing this report. Appendix A provides a list of the contractors and technical studies conducted.

This report covers the economic and other technical considerations involved in pursuing a course of regional cooperation, and does not constitute the Administration's proposed course of action in this area. The Administration's policy strategy on regional cooperation is now under review in the context of a broader study of the economic implications of peace in the Middle East.

February 1, 1979


Assistant Administrator
Bureau for Near East
Agency for International
Development

REGIONAL COOPERATION
IN THE
MIDDLE EAST

Table of Contents

	<u>Page</u>
Chapter I Executive Summary	1
Chapter II Overview	8
A-Introduction	8
B-Middle East Experience in Regional Cooperation	8
C-Arab and Israeli Attitudes Toward Cooperation	13
D-Scope for Regional Cooperation	17
E-Benefits of Cooperation	20
F-Promoting Cooperation	21
G-The West Bank and Gaza	25
Chapter III Science and Technology	27
A-Overview	27
B-Health	37
C-Agriculture	43
D-Marine Sciences	50
E-Meteorology	54
F-Education	56
G-Social Sciences	61
H-Other Areas	64
1-Remote Sensing	64
2-Appropriate Technology	67
3-The Physical Sciences	69
4-Alternative Sources of Energy	70
5-Manpower Planning	70
6-U.N. Conference on Science and Technology for Development	72
Chapter IV Transportation	74
Chapter V Telecommunications	80

Chapter VI	Water	86
	A-Fresh Water	86
	B-Desalination	92
Chapter VII	Energy	98
	A-Electric Power	98
	B-Solar Energy	103
	C-Natural Gas Utilization in the Sinai	106
Chapter VIII	Industry and Mining	110
	A-Industry	110
	B-Minerals	113
Chapter IX	Tourism	117
Appendices	A-List of Contractors and Technical Studies Conducted	
	B-Summary of West Bank and Gaza Economies	

CHAPTER I. EXECUTIVE SUMMARY

A. Introduction

In order to provide the technical information required for this study, A.I.D. commissioned nineteen evaluations of different sectors of potential cooperation which have been suggested by others or identified in our studies of the subject. These were undertaken by eight other Government agencies and ten private individuals and firms.

The term "regional cooperation" was interpreted as cooperation between Israelis and Arabs in any economic, scientific, technical or other field; activities between Arab States or within one country that have potential to eventually involve Israel; all development activities within the West Bank and Gaza; and projects in one country that could have a significant regional impact. The major focus was on Egyptian-Israeli cooperation, but many of the activities between those countries could easily be undertaken in other countries in the region when political conditions permit.

Our evaluation suggests that there is moderate potential for economic and technical cooperation between Israel, Egypt, the West Bank and Gaza, and ultimately other Arab countries. Enough common problems and needs in a number of areas exist to make cooperation beneficial to all the parties. There also would be important political and symbolic benefits from opening contacts, lowering barriers, and lessening the suspicions and hostilities of thirty years of confrontation.

The scope of cooperation, however, is likely to be limited and many suggestions that have been advanced did not prove to be economically or technically viable or likely to be acceptable to all parties. There also are many problems associated with cooperation and it will have to be approached cautiously with careful consideration of national sensitivities. Cooperation among nations has never guaranteed peace, nor will it in itself bring about major economic changes.

B. Background

Since the establishment of the State of Israel in 1948, contacts between Israel and the Arab world have been extremely limited. Numerous proposals for initiating Arab-Israeli cooperation have been advanced over the years,

particularly since President Sadat's visit to Jerusalem in 1977. Many of these essentially involve the provision of Israeli technical assistance to the Arabs, while others are concerned with large-scale projects such as desalination or land reclamation. Most of these proposals have not been subjected to any rigorous economic or technical analysis and make overly optimistic assumptions on the benefits and problems of cooperation.

There is a very high degree of formalized inter-country contact among the Arab states, reflected in a plethora of inter-Arab organizations, covering many different fields. The difficulties which many of these organizations have faced in achieving significant results point up some of the problems involved in implementing regional cooperation. Although it has been suggested that Israeli integration into the Middle East could be partially accomplished through joining some of these organizations, most of them are Pan-Arab based and would not welcome Israeli or other non-Arab participation. Participation in UN regional groupings in the Middle East is a better possibility and would be beneficial to both sides.

Both Israel and Egypt have had considerable experience in providing assistance to developing countries, but this has been technical assistance rather than real cooperation. It thus has little relevance to regional cooperation.

Egyptian and Israeli attitudes toward cooperation differ in some respects. The Egyptians generally exhibit a cautious receptivity to cooperation, once a treaty has been signed. Although little thought seems to have been devoted to the subject, some Egyptians have expressed approval for cooperation, particularly in science and technology. There is, however, apprehension over the imbalance of Egyptian and Israeli resources and capabilities and fear of potential Israeli domination. The Egyptians believe that cooperation should be in areas in which Egypt would directly benefit and should not be pursued for its own sake. Many also believe that the United States must participate, at least in the initial stages of cooperation.

The Israelis embrace the idea of cooperation with enthusiasm and are much more willing to promote cooperation for its own sake and for its potential political and symbolic benefits they perceive for themselves. They are open to almost any form of cooperation and extensive, if uncoordinated, planning for peace is taking place. Thoughtful Israelis have shown considerable awareness of Egyptian hesitations and advocate a cautious approach in developing relations.

Other Arab countries presently will not consider the possibility of cooperation until a wider peace settlement is reached.

C. Scope for Regional Cooperation

Cooperation can be based on shared resources or solutions to common problems. The Arabs and Israelis share a few natural resources--the Jordan Valley, the minerals of the Dead Sea, and the Gulf of Aqaba--where cooperation would be natural under normal circumstances. Outside of these, there are few resources that could be developed cooperatively. There would be some possibilities on the Sinai but, due to Egyptian sensitivities on Israeli involvement there, the Sinai will most likely not be a focus of formal cooperation in the near future. There is a good possibility, however, of early informal cooperation in the sharing with Egypt of information obtained on the Sinai during the years of occupation.

The coming of peace also will require links between geographically proximate countries, which have seldom been in normal contact, creating an immediate need for transportation and telecommunication projects.

The motivation behind many cooperative activities often will be largely symbolic and political. Activities, which might be of marginal importance in other circumstances, thus may be proposed. Although the deciding factor in evaluating an activity may be symbolic, the United States should only support projects which are technically and economically sound according to normal project evaluation criteria. Enough viable possibilities have been identified that this should not be a problem.

In the immediate future, science and technology (S/T) cooperation between Egypt and Israel offers the most possibilities for cooperation. This derives from the existence of areas of common interest where capabilities have some degree of balance and from the flexibility of S/T cooperation; it can take place with varying visibility, utilizing many different mechanisms, approaches, and institutions. The level and mode of S/T cooperation can be adjusted to fit the needs of any particular circumstances, making it the easiest way to begin cooperation in an environment where contacts are likely to be awkward and uncertain. With a few exceptions however, the technology is available from other sources and, while cooperation could be useful, there rarely will be a compelling reason for either side to cooperate with the other.

The following S/T areas are particularly good possibilities: arid-land agriculture, including water management, salt-tolerant crops, land reclamation, and other areas; aquaculture; health, particularly biomedical research in parasitic diseases; marine sciences relating to the Gulf of Aqaba; alternative sources of energy; small scale desalination; and remote sensing. Some potential was found in education, the social sciences, meteorology, manpower planning, appropriate technology, the physical science, and other fields.

Transportation and telecommunications projects also have potential for the near future. Detailed studies of road links and a coaxial cable or radio relay across the Sinai would be first steps. Jordan would particularly benefit from further regionalization of the areas transportation and communication networks when that becomes politically feasible.

Water is crucial to development in the Middle East, but the scope for water sharing between Israel and Egypt is limited. The sale of Nile water to Israel is a possibility, although this would be, at best, temporary, since Egypt intends ultimately to utilize the full flow of the river. Cooperation among the riparian states of the Jordan River system in the study, planning and utilization of the surface and ground waters of the Jordan Valley watershed would be extremely beneficial. Desalination is not yet practical for agriculture purposes, but small-scale desalting of brackish water has potential.

In energy, there may be some scope for cooperation in power generation and transmission between Israel and Egypt including providing power to the Sinai, but a number of difficulties would have to be surmounted. Regionalizing transmission networks in Israel, Jordan, Syria, and Lebanon would be particularly beneficial. Solar energy applications also is a promising field for cooperation. A preliminary investigation of a proposal for the construction of a natural gas pipeline from the Arabian Peninsula to the North Sinai to deliver natural gas for industrial use and power generation indicated that the project would not be feasible at this time.

There is little scope for cooperation in mineral development outside of sharing technology and experience in the exploitation of Dead Sea minerals. There is likely to be only limited potential for joint industrial projects in the short run. Tourism is growing rapidly in the Middle

East and investments in this sector have been very profitable. They should attract sufficient private investment with little encouragement.

D. Benefits of Cooperation

Regional cooperation in the Middle East is advocated for many reasons, but most of them involve either: 1) cooperation to develop common resources and solve common problems, or 2) cooperation to assist the peace process and help solidify a peace settlement.

As indicated above, there are only a few common resources shared by Israel and the Arabs. There are common needs, but rarely will cooperation be essential to meeting these. Cooperation will be very helpful on helping to create the basis of a lasting peace through such things as developing relationships among the parties and creating an economic stake in the continuance of peace. The potential symbolic and political effects of cooperation, however, can be exaggerated as much as the economic benefits can be. It cannot be a panacea for the problems of the region. The benefits thus will be significant but limited.

E. Promoting Cooperation

Given the sensitivities and complexities involved, cooperation should not be pressed too hard on the parties. The general admonition is to move slowly and cautiously.

The United States could play a crucial role in facilitating cooperation. U.S. participation could help initiate, organize, and fund activities; provide an umbrella for cooperation; and soften the impact of dealing with a former enemy, particularly in the early stages when contacts are likely to be awkward and uncertain. Many Egyptians believe that the United States must be heavily involved in arranging contacts and see the U.S. role as essential. Many feel in particular, that cooperation in science and technology should start on a trilateral basis. The Israelis do not consider the U.S. role as important as the Egyptians do, but understand and accept the need for it. U.S. funding also could play a role; the availability of funding is unlikely to make the parties agree to something that they do not want to do, but it may well make some activities possible that would not be otherwise. Provision of funds for exchanges of scientists, for example, would not involve significant resources, but might provide the foreign exchange that could make trips possible.

The U.S. role would not have to be entirely governmental. The academic, scientific, and business groups have expressed interest in cooperation and can play an important part. There is a deep interest in Middle East cooperation within the U.S. scientific and academic community, and private firms can serve as bridges between Israelis and Egyptians interested in joint ventures and other investments to the extent they prove to be feasible.

Cooperation could be promoted in many ways. An overall mechanism is not essential, but an Egyptian-Israel joint commission, or trilateral commission with United States participation would be useful for identifying topics of common interest, facilitating contacts and serving as a conduit for funding. The commission could cover all potential cooperative projects or be restricted to particular areas of cooperation, especially science and technology. A commission could have its own secretariat or it could utilize existing organizations within the countries to carry out its activities. This idea may not be acceptable to both Egypt and Israel. If established, a regional cooperation fund also could serve as a convenient focal point for promoting and funding cooperative activities.

A related concept is for "commercial clearing houses" to be set up in Cairo and Tel Aviv. They would facilitate trade and investment between Israel and Egypt until the countries become more familiar with each other. The United States, with major commercial activities in both countries, could play a useful role in facilitating the establishment of these organizations.

Funding of projects having regional implications as single country, rather than regional projects, may in many instances be the most appropriate strategy to begin assisting cooperation. These could be funded out of current bilateral programs. Improvement of roads on the Sinai, for example, would be considered as national by Egypt but clearly would be essential to a regional transportation network. Funding parallel research projects and developing Arab institutions so they can better cooperate with Israel are other possibilities. This approach would provide a degree of flexibility; projects that are considered regional by one party may be considered national to another, according to the political needs of each.

Further development of the project possibilities identified in this report will require more detailed analysis than was possible in this study. Because of time constraints,

few of the agencies or contractors were able to prepare detailed project-level data. Most of the projects are orders of magnitude estimates that will have to be refined so they can be subjected to technical review. This will require field work and participation of the parties. In most cases, it is not possible to further develop ideas without input from the Egyptian and Israeli individuals and institutions concerned.

Funds presently available in the FY 1979 A.I.D. budget for regional activities (\$5 million) should be sufficient for the immediate follow-up activities identified in this report such as exchanges of personnel, conferences, workshops, joint research and similar activities to begin Egyptian-Israel cooperation. Pre-feasibility studies and, perhaps, some feasibility studies for projects also could be funded. However, the funds are not sufficient for any of the infrastructure projects identified in the report. As indicated above some of these projects, such as roads in the Sinai, could be considered for financing under existing bilateral programs.

CHAPTER II OVERVIEW

A. Introduction

To provide the technical information required for this study, A.I.D. commissioned nineteen evaluations of different sectors of potential cooperation suggested by others or identified in our study of the subject. These were undertaken by eight other Government agencies and ten private individuals and firms. The various reports differ considerably in completeness of their coverage of particular areas and their assessment of the potential for meaningful cooperation. However, they did provide a broad base for evaluating the overall scope for regional cooperation.

The studies were intended to cover all of the confrontation states, as well as other Arab States to the extent that projects would affect them. Due to current political developments, a heavy emphasis was placed on the potential for cooperation between Israel and Egypt. Many of the activities identified could easily be undertaken in other countries in the region when political conditions permit.

The term "regional cooperation" is defined here as cooperation between Israelis and Arabs in any economic, scientific, technical or other field; all development activities within the West Bank and Gaza; activities between Arab States or within one country that have potential to eventually involve Israel; and projects in one country that could have a significant regional impact. "Interaction" or "reciprocal relations" are among the other terms which could denote the same kind of activity. Cooperation includes activities which would be routine and normal between neighboring states enjoying friendly relations as well as specific actions relating to the achievement of Middle East peace. The term can be stretched or focused as convenience dictates. Our approach has been pragmatic, giving it a broad interpretation for the studies we commissioned.

B. Middle East Experiences in Regional Cooperation

Since the establishment of the State of Israel in 1948, there has been only extremely limited contact, much less cooperation, between Israel and its Arab neighbors. Since the 1967 war, the occupied West Bank and Gaza have become closely and increasingly economically integrated with Israel. Some Israeli goods entered the Arab countries via the Jordan bridges and some Palestinians from the West Bank and Gaza

received training in Israeli technology and then employed these skills in the Arab World. There are occasional reports of Israelis and Arabs interacting professionally at international meetings of scientific and other organizations but this is sporadic and probably relatively rare. Conferences between Israelis and Palestinians or other Arabs on Middle East issues also have been very limited.

Since the 1950's numerous schemes have been advanced for breaking that isolation. The basis for these ideas has generally been political, with cooperation viewed as a means to bring the Arabs and Israelis together through economic interaction or to try to resolve the Palestinian problem through resettlement of the refugees in the Sinai, Jordan Valley or elsewhere. Some involved cooperative use of the water systems of the area. From 1968-1971, for example, Oak Ridge National Laboratory conducted a study of the feasibility of a large-scale joint desalination and electric power production facility in response to the Senate Water for Peace Resolution. A number of individuals have advocated similar proposals since then. Other ideas involving cooperation in different fields were suggested during this period but none had any chance of adoption in the political context of the time.

Since President Sadat's visit to Jerusalem in November 1977, suggestions for cooperation proliferated, coming from a variety of private individuals and groups who are interested in Middle East Peace. Many of these proposals essentially involve Israel's providing technical assistance to the Arabs, particularly in those areas, such as agriculture, where Israel is considered to have particular expertise. Others involve large-scale water and land reclamation projects especially for the Sinai. An increasing number of conferences, articles, letters, and other expressions attest to the interest in this subject.

Many proposals do not demonstrate a sophisticated view of regional cooperation. Although there are exceptions, most were not based on an in-depth analysis of the technical, economic, and other factors involved. Advantages of cooperation and the ease with which it can be implemented often have been exaggerated and the problems of inhibiting cooperation, technology transfer and development have been understated or ignored. Ideas which have not been subjected to rigorous technical or economic analysis have, in some cases, created expectations which cannot realistically be attained. There is a need for realistic and careful evaluation of technical possibilities and economic and social benefits of cooperation.

before any investments are approved.

Inter-Arab Cooperation

The Arab World has an extremely large number of regional organizations in many different fields representing numerous mechanisms of inter-Arab cooperation. This plethora of organizations, conferences and associations, in numerous areas of science and technology, development, finance, customs unions, military matters, education, and other fields is difficult to track, as many of them have been created in name only and have never actually operated. Still, the degree of formalized inter-country contact among the Arab States is considerable. A major focus of Arab cooperation is the Arab League, which has over twenty specialized agencies, such as the Arab Center for the Study of Arid Zones and Dry Lands and the Arab League Educational, Scientific and Cultural Organization (ALESCO), with its many activities. The Council on Arab Economic Unity (CAEU) is a Common Market arrangement, while the Arab Scientific Union, the Union of Arab Industries, the Union of Arab Research Council, the Federation of Arab Engineers, organizations in transport, telecommunications, and other fields, cover many other functional areas. Most of the organizations date only from the 1970's and new ones constantly are created. The Economic Commission for West Asia, for example, recently approved the establishment of an Arab Regional Centre for the Transfer and Development of Technology.

In finance, the Arab Fund for Economic and Social Development (AFESD) places the highest priority on inter-Arab projects, while other development finance institutions of the oil-producing states such as the Kuwait Fund, the Abu Dhabi Fund and the Saudi Fund provide a substantial portion of their assistance to other Arab states. In addition to financing through these formal funds, Arab oil states supply large amounts of bilateral aid directly to the less endowed Arab countries. There also are numerous investment companies and banks (such as the Arab Investment Company, Arab International Bank, and the Kuwait Investment Corporation), that provide financing for projects in the Arab World.

International organizations also contribute to inter-Arab activities. Some of the specialized agencies of the UN, for instance, are regionally organized to include primarily Arab countries. UNESCO, through its Regional Office for Science and Technology in the Arab States, for example, and FAO, and others are carrying out their activities on an inter-Arab basis.

Finally, there is a large volume of inter-Arab contacts through official and unofficial exchanges of scientific, technical, educational, and administrative personnel. Egypt has been the largest provider of such personnel, particularly in education, with increasing numbers of Jordanians and Palestinians going to the oil countries. The role of Egyptian universities as major educational centers also is important.

The success of these organizations and contacts is mixed. The creation or planning of some has been announced with little or no apparent result. Some suffered from the general problems of cooperation in developing countries, such as the non-complementarity of the economies. Much cooperation has been at the discussion level, in the form of conferences or meetings for exchanging information, planning projects yet to be implemented and proposing schemes for future implementation. Other organizations, while suffering from some management problems that exist at the national level, seem to function well and are making real contributions to regional development and integration. They seem to operate in spite of shifting political sands in the Arab World and contacts on many levels are maintained regardless of bitter political or ideological rivalries.

Implications for Arab-Israeli Cooperation

This experience of inter-Arab cooperation is significant to possible Arab-Israeli cooperation. Many proposals for the creation of new regional organizations including Israel would duplicate already existing organizations. Others have suggested that Israel could become integrated with some of the already existing Middle East regional organizations.

Suggestions that a regional organization be created in, for example, arid land agriculture, often are made without consideration of the currently existing regional and national institutions in the area. There are, in fact, regional Arab institutions dealing with most issues usually mentioned as crucial regional problems. The effectiveness of some of these institutions may be questionable and their existence may not preclude the utility of establishing a new organization. This could be especially true if a new organization were needed to address a problem area in which Israelis have particular competence. This would have to be carefully looked at in each case.

Israeli integration into existing regional organizations is unlikely to take place in the near future. The inter-Arab

pattern of relationship has developed independently of Israel (and of other non-Arab Middle Eastern States), and is based on Pan-Arab ideology rather than geographical considerations. Despite great differences among the Arab countries, there is a deeply held, if sometimes theoretical, belief in the unity of the Arab peoples and cultures that forms the underpinning of most Arab regional organizations. Thus, Arab countries like Morocco or Somalia which are geographically or historically somewhat remote from the Arab heart-land normally participate in inter-Arab activities, while non-Arab Turkey and Iran, which are closer in terms of history and geography, normally are excluded. Organizations connected with the Arab League obviously are limited to countries which are defined as Arab. Most other Arab organizations usually make reference to Arab unity and to common political and cultural assumptions and historical memories. Inclusion of any non-Arab country would be difficult, completely aside from the bitter antipathies caused by the Arab-Israeli conflict. This situation is unlikely to change significantly, even in the context of a more comprehensive peace settlement.

There are a number of exceptions to this general principle. The Islamic Development Bank includes non-Arab Islamic countries such as Pakistan. The Arab countries routinely participate in regional organizations that are not Arab based, e.g., the North African countries involvement in African organizations. Also, some organizations are based on specific geographical considerations. The Persian Gulf area, for example, has regional organizations in such fields as pollution that necessarily include Iran. This suggests that certain regional organizations organized around common problems that clearly involve Israel might welcome Israeli participation. A group concerned with management of the Gulf of Aqaba would certainly need Israel participation, given the strong impact of its activities, along with the other littoral states. An organization concerned with water management also might eventually welcome Israeli participation because of its expertise in that field in the Middle Eastern environment. The criterion would be for an organization to define itself in functional rather than Pan-Arab terms.

Israeli integration into Middle East regional groupings of international organizations such as the FAO, WHO, World Meteorological Organization, etc., might be an easier task, since these are in theory regionally organized. This would

that it would belong to in more normal political circumstances. Both Israel and the other member countries could greatly benefit from this.

Finally, there is no reason why, as the peace process progresses, Israel could not cooperate with Arab regional organizations in the same way that U.S. and European institutions do. Some Arab organizations could look to Israel for technology and assistance in certain fields in which Israel has particular expertise just as they would look to any developed country. In this context Israel would be considered like any source of technology but one with particularly relevant experience in some areas.

Israeli and Arab Experience in Technical Assistance

Both Israel and Egypt have significant experience in providing technical assistance to other nations. Since 1958 Israel has sent about 7,000 experts to developing countries while training more than 20,000 people in Israel. Until the mid-1960s most programs were directed toward Africa and Asia; since then political problems have led to greater focus on Latin America. Israel's assistance emphasized manpower training and development, particularly in agriculture and community development. Most accounts rate the program as quite successful but this experience has somewhat limited relevance to regional cooperation. Even though labeled cooperation, the assistance involved a donor-client relationship that might not be applicable to cooperation with the Arabs. Experience in transferring technology to other nations and cultures would be valuable in those areas where Israel is providing technical assistance. But the usual aid mode of cooperation would probably be unacceptable to the Arabs.

Egypt's assistance, primarily but not exclusively devoted to the Arab world, is less formally structured but larger in actual numbers than Israel's. Much of it grows out of Egypt's educational and cultural leadership in the Arab world. There were recently, for example, some 35,000 Egyptian teachers in the other Arab countries paid for in most cases by the recipient country. Cairo is by far the region's leading educational center.

C. Arab and Israeli Attitudes Toward Cooperation

The exaggerated expectations of the benefits of cooperation appear to exist largely outside of the region itself.

The enormous and unrealistic expectations of the fruits of peace that some Egyptians have are not at all predicated on cooperation with Israel. While some Israelis have discussed the mutual advantages that opening the borders would bring, those working on the subject are much more cautious. In discussing attitudes toward cooperation, particularly among the Arabs, the fluidity of the situation should be kept in mind. Further development in the peace process could quickly and radically alter many views. There also is some divergence in Arab attitudes as seen by different observers, itself an indication of the ambiguity of feelings on this question.

Egypt

The position of the Arab states, including Egypt, has always been that any cooperation with Israel must follow rather than precede a political settlement. Egypt is waiting for the treaty to be signed and ratified before serious formal consideration is given to cooperation. In general, the idea appears to be given a cautious receptivity. Most seem to believe that all relationships with Israel should evolve over time as a natural consequence of peace and not be forced. Establishment of scientific and academic contacts with Israel is generally looked upon favorably and some Egyptians express general approval of the concept of cooperation. Few appear to have given thought to specific plans or proposals and there are no known official efforts to identify or plan regional activities. Egyptian planning for peace appears to be in part based on the hoped for continuing high levels of economic assistance for internal development. While a certain amount of such assistance could be devoted to cooperative projects, Egypt is opposed to pre-conditioning assistance on Egyptian-Israeli cooperation. Most Egyptians believe that Israel has little technical expertise that is not available from the U.S. and Europe, although they may see a few exceptions to this.

There is a widely felt apprehension in Egypt over the imbalance of Egyptian and Israeli resources and capabilities. Egyptians are sensitive about their relative poverty and underdevelopment compared to Israel. Some Egyptians fear what they perceive as potential Israeli neo-colonialism and domination of the Egyptian economy. Israel is seen as having superior organizational, technical and managerial abilities. Some Egyptians who consider Egyptian contacts with other Arab states as vital, fear that cooperation with

Israelis will jeopardize these links. There is a general concern with the effects that cooperation might have on relations with other Arab states. The legacy of the years of conflict and war is another factor; there is no reservoir of good will toward Israel.

Of crucial importance will be the tone set by Egyptian leadership. Lacking a clear signal from the top, most Egyptians will remain cautious and not get out in front of whatever position may emerge. The Egyptian approach in general appears to be that cooperation should be in areas favorable to Egypt, in which Egypt would benefit, and should not be cooperation for its own sake. Activities should be in areas where Egypt is roughly equal to Israel.

The advice offered to the U.S. is "don't push". Contacts will take place in an evolutionary fashion, over time. Many Egyptians also seem to feel, however, that the U.S. can be a catalyst in bringing people together in conferences and other fora and indeed, that the U.S. could be a useful third party to cooperative activities in the initial phase. This belief in the need for a tri-lateral relationship appears to be widespread.

Israel

Israel embraces the idea of cooperation with enthusiasm and is much more willing to develop cooperation for its own sake and for the potential symbolic and political benefits involved. The pace in planning, study, and interest in regional cooperation has fluctuated with the ups and downs of the peace process. Since Camp David, however, extensive, if uncoordinated, planning for peace has begun on an active basis. Much of this is in the universities. Each of the major universities set up some kind of committee or ad hoc working group to explore possibilities and develop proposals. The most advanced is the Research Project on Peace at Tel Aviv University. Hebrew University also has a major project. Numerous articles and monographs have been written and conferences held on the subject and a ministerial committee has been set up along with some other official activities.

The range of research carried out and proposals developed is broad. Some propose cooperative development on the Sinai and a number advocate exchange of Israeli technology in agriculture and water management for Nile River water. Planning appears to be directed toward Egypt, with little attention paid to Jordan and other countries in the region.

Despite the eagerness of many Israelis to work with and assist Egypt and despite occasional suggestion of very large, high visibility joint projects (such as large scale dual purpose electric power-desalination schemes), most thoughtful Israelis advocate caution in developing relations. The watchwords are "low visibility," "incremental approach," and "go slowly". Many Israelis demonstrate at least an understanding of Egyptian hesitations and fears of any hint of neo-colonialism and believe that activities should give equal voice to the parties, should be truly cooperative rather than technical assistance in nature, and should have an overall balance of benefits. The danger of becoming the "ugly Israelis" is often expressed. This is seen particularly in the desire to avoid, for example, projects where Egyptian labor works for Israeli foremen. It appears that the government already has decided against allowing free flows of low cost Egyptian labor into Israel because of the overall negative impact this could have on long-run relationships.

A common theme in Israel is an expressed ignorance of Egyptian economy, society, and culture, resulting from thirty years of separation, and the need to learn more in order to know how and where to cooperate. Many Israelis appear to accept the usefulness at least as initial stages of a trilateral approach with the U.S. or another third party (but not the UN) developing initial contacts. They do not, however, seem to favor this method as strongly as the Egyptians who have been interviewed.

Jordan

In present circumstances, cooperation with Israel is not considered a possibility until a political settlement is reached or in sight. If a satisfactory settlement were reached the development of working relationships with Israel seems to be assumed, as long as these deal with real development needs of Jordan. Interest in acquiring Israeli technology, for example, has been indicated by some Jordanians. Jordan fears of possible Israeli domination are similar to those in Egypt.

Syria

Syria is not considering cooperation with Israel. In the long run, after a comprehensive settlement, it might become possible but would probably develop very slowly even after peace were attained.

Other Countries

Arab countries not sharing a border with Israel would have relatively little need to cooperate in the best of circumstances. They could, if desired, turn to Israel as a source of certain kinds of technology. It is doubtful that any thought has been given to this, although the fear of Israeli domination appears to be common throughout the entire region. It is likely that normal relations could eventually develop with most other Arab states but these would not have to involve close contact or cooperation.

The West Bank and Gaza are of course, engaged in important economic relations with Israel. The attitude of West Bankers and Gazans toward any voluntary cooperation with Israel appears to be extremely negative, although this could change in time as a settlement emerges. The contacts and relations that have developed since 1967 could be an excellent base for cooperative activities if this attitude should change.

D) Scope for Regional Cooperation

The potential for cooperation largely depends on the existence of significant common resources and problems that should be dealt with cooperatively. It is asserted that the lack of cooperation seriously retarded the development of the region. Our studies, however, have not supported this conclusion; common needs and problems do exist but the scope may be smaller than has been generally assumed.

There appear to be relatively few common resources shared by Israel and the Arabs. The Dead Sea, with its potential for further minerals development, the Gulf of Aqaba and the Jordan River system are good examples of truly shared resources. Outside of these, however, there are few cases. The Mediterranean is a resource shared by a number of Middle Eastern states but it involves many other countries as well and cannot easily be approached in terms of Arab-Israeli cooperation.

The Sinai sometimes is considered to be a common resource, but Egypt so far has expressed its unwillingness to involve the Israelis in the development of its largely unknown but possibly significant potential. The other occupied territories are in no way considered by the Arabs to be a shared resource where Israel participation would be welcomed.

The southern Rift Valley, below the Dead Sea, could be considered a shared resource between Israel and Jordan, although it is being developed independently on each side.

There are, in addition, links in transportation and communications that would be normal among states that are geographically proximate. The coming of peace will require development of these links, creating an immediate need for transportation and telecommunications projects. There also is potential for cooperation in the application of solar energy and, ultimately, in electric power, as well as for private sector cooperation in tourism. Finally, there is a good possibility of Egyptian cooperation with Israel at an early stage in sharing information obtained on the Sinai during the years of occupation. This would be highly beneficial to Egypt and this kind of cooperation during the transition would be very constructive in establishing a climate for cooperation between the two countries.

Despite the great differences between their societies and economies, Israel and the Arab countries do share many common problems to which science and technology could be applied. Many of these are related to the problems of arid land agriculture in the Middle East environment. The Arabs, and, to a lesser extent the Israelis, would benefit from sharing technology and experience in a number of fields. Of course, with only a few exceptions the technology desired is available from other sources and collaboration with the other side may not be the most effective manner of addressing the problem.

Areas of Potential Cooperation

The overall potential for regional cooperation thus appears to be modest. There are real benefits to be obtained through cooperation, but the possible sectors are somewhat limited in number and scope.

In the near future, science and technology (S/T) cooperation between Egypt and Israel offers the most possibilities for early cooperation. This derives from the existence of several areas of common interest where capabilities have some degree of balance and from the flexibility of S/T cooperation. Such cooperation could begin with varying levels of visibility and utilize many different mechanisms, approaches, and institutions. We have identified a number of areas in science and technology where cooperation would be feasible and mutually beneficial. These

include arid-land agriculture (including water management, salt tolerant crops, land reclamation, and other areas); health (particularly biomedical research in parasitic diseases); alternative sources of energy; marine sciences in the Gulf of Aqaba; and remote sensing. There are a few areas such as pollution control of common waters and weather forecasting and control where effective projects require cooperation among the affected states. Some potential for cooperation also was found in education, the social sciences, appropriate technology, the physical sciences, manpower planning and other fields.

Transportation and telecommunication projects have the best potential for infrastructural projects in the near future. Road links and a coaxial cable or radio relay across the Sinai would be the first steps. Jordan would particularly benefit from further regionalization of the transportation and communication networks when that becomes politically feasible. Potential projects may exist in the West Bank and Gaza e.g. indirect links between the two territories; the internal transport needs of the two areas were not studied for this report.

Water is crucial to development in the Middle East, but the scope for water sharing between Israel and Egypt is limited. The sale of Nile water to Israel is a possibility, although this would at best be temporary, since Egypt intends ultimately to utilize the full flow of the river. Cooperation among the riparian states of the Jordan River system in the study, planning and utilization of the surface and ground waters of the Jordan Valley watershed would be extremely beneficial. Large scale desalination is not yet practical for agricultural purposes, but small scale desalination of brackish water is a possible area of cooperation.

In energy, there is some long range possibility of cooperation between Egypt and Israel and potential for cooperating in providing power to the Sinai. Regionalizing transmission networks in Israel, Jordan, Syria, and Lebanon would be beneficial. Cooperation in the application of solar energy appears to be promising. The proposal for a natural gas pipeline from the Arabian Peninsula to the North Sinai did not prove to be economically feasible.

There is little scope for cooperation in mineral development outside of sharing technology and experience in the exploitation of Dead Sea minerals. There may be some potential for joint industrial projects. Tourism is growing

rapidly in the Middle East and investments in this sector have been very profitable. They should attract sufficient private investment with little public sector encouragement.

E) Benefits of Cooperation

Regional cooperation in the Middle East is advocated for many reasons but most of them fall into two broad categories: 1) cooperation to develop common resources and solve common problems; and 2) cooperation to assist the peace process and help solidify a peace settlement. As indicated above, cooperation of the first kind has some potential but the scope is limited. The belief that cooperation will assist in creating a stronger and more durable peace and in promoting Arab-Israeli reconciliation is undoubtedly the major motivation behind most promoters of cooperative activities. This belief is held by many Israelis but probably by fewer Arabs. Arabs tend to favor cooperation for its more tangible benefits.

The symbolic value of any kind of Arab-Israeli cooperation in the earlier stages of normalization would be great and in later stages could still be of much importance in deepening the impact of a peace settlement and in creating new attitudes and expectations. For example, it may not be crucial from a technical point of view that Egypt and Israel cooperate in health research but it could well be encouraged for its less tangible benefits. There are a number of areas of technology where Egypt and Israel can learn from each other. In infrastructural projects, joint work on sound projects could have significant political value. Construction or improvement of certain Sinai roads, for example, could have considerable symbolic as well as practical value in linking Egypt with Israel and ultimately with the rest of the Arab world. There are a number of areas in which such cooperation could take place. The availability of U.S. financing for engineering and construction and U.S. assistance in bringing the parties together might help to make this kind of cooperation more attractive to the Arab side.

As a historical framework, it should be noted that economic or technical interactions or other forms of cooperation among countries have not guaranteed peace even among nations of considerable cultural and economic similarity. There are a number of examples in the developing world, such as Central America or East Africa, where significant efforts toward economic and technical cooperation did not prevent a total breakdown of relations. The Arab world

itself offers many examples of the difficulties of cooperation. Regional cooperation could be useful to all the parties but the benefits should be realistically assessed.

F) Promoting Cooperation

Joint Commissions

It is not necessary to have an overall mechanism to coordinate cooperation; infrastructural projects could be planned and implemented on an individual basis, while the many activities in science and technology could be managed using the mechanisms described in the S/T section. However, a commission or committee to arrange, coordinate and carry out cooperative activities and serve as a channel for funding would still be very useful and could be explored with the parties.

An Egyptian-Israeli bilateral commission would provide a focal point and official sanction for cooperation. There are a number of organizational forms and models for such commissions that could be followed. A commission would, however, be highly visible and it is not certain this mechanism would be acceptable to both parties in the short term. Less visible commissions on particular topics, particularly in science and technology, might be more feasible. (This concept is developed more completely in the S/T section of the paper.)

A trilateral commission including the U.S. would formalize the U.S. role as the midwife and intermediary of cooperation. The need for the U.S. to play that role is particularly perceived by many Egyptians. A commission could serve as a convenient conduit for assistance and funding. It also would be very visible, but could be limited to certain areas as a first step.

There are a number of models for joint commissions, including several commissions in the Middle East with the United States. Some commissions, such as the U.S.-Saudi Arabian Joint Commission, have their own staff (in the U.S.-Saudi case, an office in the Treasury Department and a staff in Saudi Arabia), and have operating responsibilities. In most cases, however, the commissions do not have their own staff and rely on other organizations to carry out their activities. Although an Egyptian-Israeli-U.S. commission could develop a secretariat, it probably would be more expeditious to utilize existing organizations in each country.

To enable the commission to begin activities more quickly, the scientific academies in each country would be good candidates to implement the commission's projects; other possibilities also could be considered.

A related concept involves establishing "commercial clearing houses" in Cairo and Tel Aviv. They would facilitate trade and investment between Israel and Egypt and perform some of the functions usually done by embassy commercial offices. The need for such institutions stems from the expressed ignorance of Israelis and Egyptians on doing business in the other country. The clearing houses would provide such services as organizing seminars on doing business, sponsoring trade-promotion events, contacting individual companies regarding specific activities, undertaking market research, and preparing business guides. They would bridge the gap until embassies, as well as private firms, become familiar enough with business conditions to perform these functions directly.

The United States, which has major commercial activities in both countries, could play a useful role in facilitating the establishment of the clearing houses. A U.S. Department of Commerce evaluation of the proposal suggested that it should be explored with Egyptian and Israeli officials when conditions are appropriate.

Financing Cooperation

The Department of the Treasury has assessed three possibilities for the institutionalization of financial support for regional development (listed below). None of these would be politically feasible until a wider peace settlement is reached. World Bank officials have indicated informally that this institution might be willing to support regional cooperation if all the countries in the area requested it to do so. It probably would be unwilling to explore the idea until such a broad-based request were made. When a more comprehensive settlement is reached, it would be useful to explore these possibilities to try to broaden support of regional cooperation.

The Treasury suggestions are:

- 1) A World Bank led consultative group - A possible weakness of this suggestion is the paucity of regional projects and the fact that Arab donors thus far have shown only limited interest in consultative groups.

2) A Development Authority - This would help to design and implement projects. It would receive modest amounts of funds from the U.S. and other donors for administrative costs, and would play an organizing and coordinating rather than a direct financing role. Projects overseen by the Development Authority would be funded directly by bilateral or multilateral donors. The World Bank would be expected to assist the Authority in staff recruitment, project evaluation and management.

3) Middle East development bank - This would be patterned after regional banks in Asia, Africa, and Latin America with regional and non-regional membership. This would have to be considered in the context of the fact that there already are many national and multilateral funds serving the area.

Bilateral Projects with Regional Implications

There are a number of projects with regional impact that could be funded out of current bilateral programs. Improvement of roads in the Sinai, for example, would be considered as national by Egypt, but would be clearly essential to a regional transportation network. A bilateral funding approach gives a degree of flexibility to the funding process; projects which are considered regional by one party may be considered national by another, according to the political needs of each. This may be particularly important to Arab countries other than Egypt, which might agree to projects that could ultimately involve Israel as long as the future Israeli connection was not emphasized.

The U.S. Role

The United States could play a crucial role in facilitating cooperation. U.S. participation could help initiate, organize, and fund activities and provide an umbrella for cooperation by softening the impact of dealing with a former enemy, particularly in the early stages when contacts are likely to be awkward and uncertain. Many Egyptians see the U.S. role as essential and believe that it is necessary to begin cooperation on a trilateral basis. Most Israelis do not consider the U.S. role to be as important as the Egyptians do, but understand and accept the possible need for it. This role would not have to be played exclusively by the U.S. Government. The U.S. scientific, academic and business communities also could make contributions and there are many indications of their interest in doing so.

Private and quasi-governmental organizations and universities can and already are making efforts to bring about Egyptian-Israeli contacts and these should be encouraged. Private companies can serve as bridges between Arabs and Israelis interested in joint ventures and other activities. The fact that the United States has first-rate capability in virtually all the areas in which the parties might cooperate--health, agriculture, communications, and so forth--makes American participation more natural and gives it a substantive as well as organizational input. The admonition not to push the parties should be respected, but we could inform them of our willingness to support cooperation and make our resources available in a variety of ways to provide assistance and encouragement.

U.S. financing may play an important role. It is unlikely that making large amounts of funding available would induce either side to undertake activities it did not wish to do. While there are a few infrastructural projects that would involve substantial amounts of money, financing generally could be designed to have a catalytic effect to assist projects in getting off the ground and to fund small-scale activities that otherwise might not be undertaken because of higher priorities and general budget constraints. Funds for exchanges of scientists, for example, would not involve significant resources, but might provide foreign exchange that could make trips possible that would not take place without assistance. Funding also could be provided to nongovernment groups in the United States and elsewhere who wish to sponsor projects or activities. In the S/T section, for example, one option would be to make a major grant to a U.S. scientific institution to plan and implement cooperative activities in S/T.

Any suggestion of technical assistance or a donor-client relationship should be avoided unless the parties, in a given case, clearly indicate an interest. Project priorities may be partially determined on the basis of the political benefits to be obtained and some activities which might not normally be undertaken may be based largely on symbolic/political grounds. We believe, however, that the U.S. should only support projects which are technically and economically sound according to normal USG project evaluation criteria.

Further development of project possibilities identified in this study will require more detailed analysis than was possible here. Because of tight time constraints, few of our contractors were able to prepare detailed project-level data.

In our studies of sectors of regional cooperation, we tried to provide estimates wherever possible of the cost requirements. In a very few areas, such as telecommunications, the nature of the projects was such that meaningful estimates were possible. In other areas, particularly science and technology, estimates were impossible without further data and discussion with the parties. The needs will vary according to the funds available and the specific requirements which cannot be predicted in advance.

The FY 1979 A.I.D. Authorization Bill earmarks \$5,000,000 for "regional programs which stress development or scientific and technical cooperation between Israel and its Arab neighbors or programs which would be used for Arab-Israeli cooperation once normalization of relations between Israel and the Arab nations occurs." These funds will be sufficient for the near-term activities identified in this paper, including conferences, workshops, exchanges, most prefeasibility studies and some feasibility studies for smaller projects. They will not be sufficient for any of the infrastructure projects identified, although some of these could be financed under ongoing bilateral programs.

G) The West Bank and Gaza

We have not addressed separately the question of cooperation between the West Bank/Gaza, Israel and the other countries because of the special political circumstances pertaining to these occupied territories. There definitely are many fields where cooperation with Israel would be beneficial to the West Bank/Gaza due to the geographical proximity of these areas and the many economic and infrastructural ties which emerged since 1967. There already are significant links with Israel in such fields as transportation, communications, and power. There is a clear necessity to cooperate in the development of water resources, as the West Bank shares an aquifer with Israel. The touristic resources of the area are closely connected. Although S/T capabilities are not yet well developed in the West Bank/Gaza, there undoubtedly would be many opportunities for cooperation in a number of S/T areas.

Under the current political circumstances, however, further cooperation of any kind with Israel would be strongly resisted by the West Bankers and Gazans. This attitude is likely to persist until there are further developments on the

political future of these areas. Development within the West Bank/Gaza, however, can continue to be encouraged under the existing A.I.D. programs there, which provide grants to a number of private voluntary organizations to undertake various development projects.

In addition to normal developmental needs in health, agriculture, education, small industry, and other areas, if a self governing entity were created it might require additional infrastructure, e.g., in transportation, communications, municipal facilities. The return of a significant number of Palestinians also would increase the demand for services and social infrastructure. An enlarged USG economic assistance program to the West Bank and Gaza probably would require an A.I.D. presence to manage the program.

Because of the significant potential role of the West Bank and Gaza as recipients of funding we have included a separate appendix describing the West Bank and Gaza economies. Before major increases in funding, it would be advisable to carry out more detailed studies by sector. A.I.D. already is moving to have some of these studies prepared.

Chapter III SCIENCE AND TECHNOLOGY

A. Overview

Science and technology (S/T) cooperation offers some of the best potential for Arab-Israeli cooperation, despite the great differences in S/T institutions and capabilities among the countries. It is commonly assumed that S/T cooperation is easier and can be more quickly implemented than infrastructural projects. Science is truly international and there have been many instances of contacts among scientists during periods of estranged political relations. What limited contacts there have been between Arabs and Israelis largely have been in this area. The strong belief in the possibilities of S/T cooperation can be observed in the expressions of interest in promoting it by the U.S. scientific community and the optimism that such cooperation would be useful in both solving regional problems and promoting peace.

S/T cooperation can take many forms and operate on many levels, giving it a great degree of variability in scope and in mechanisms for implementation. It can take place very publicly or can begin quietly, without fanfare, and range from simply exchanging information on common research or matters of joint concern, to full scale institutional cooperation or projects. Many different kinds of linkages between many different institutions can be established. The amount of funding and the organizational structures required also can vary considerably, and governments need not be formally involved. Contacts can take place between individuals, universities, research institutions as well as governmental organizations. Some subjects might be controversial, but most are not and potentially controversial topics can be avoided. These factors give S/T cooperation considerable flexibility to fit the particular political circumstances of the moment and may enable it to begin in advance of other forms of cooperation.

This section draws partly on a study of science and technology cooperation prepared by Herman Pollack of George Washington University.

Issues in S/T Cooperation

The question of why the Arabs should cooperate with Israel rather than the U.S. and Europe is particularly relevant to S/T cooperation. There is no intrinsic reason why Egypt should turn to Israel for technology that is available internationally. There are a number of areas where Israeli

technology is especially good and particularly relevant to the environmental conditions of the area, such as water management and arid land crops, but even there the technology usually is not unique. There are enough common problems to make cooperation useful but, within a few exceptions, it would not be essential for either side. The real motivation for S/T cooperation generally will rest at least partially on the symbolic benefits of developing links between Israel and the Arabs. This would be sufficient reason for most Israelis to actively pursue S/T cooperation, but since the Egyptians presently are opposed to cooperation for its own sake, cooperation may be limited to a few fields. Focusing cooperation on those areas where there really is a common need or resource problem will in most cases provide ample justification for cooperation, but the political and symbolic benefits to be obtained always will be important factors.

Another question involves the imbalance of S/T capabilities. Most observers point out the importance of maintaining a balance of contributions from both sides and avoiding the appearance of technical assistance or a donor-client relationship. In most fields, however, Israel has a clear advantage in research and implementation and in the institutional structure - laboratories, universities, research facilities. In a limited number of areas Egyptian capabilities are equivalent or occasionally even greater; we have attempted to identify these areas and emphasize activities in which Egypt has a solid footing. Despite fears of Israeli domination, however, the Egyptians are most interested in cooperation in those fields in which Israeli technology is preeminent, such as arid-land development.

It is useful to be flexible in approaching the definition and measurement of benefits. Equivalent returns are rarely possible under any circumstances, and other factors such as access to data, geographic locales (as in archeology) or particular subjects of research can be included in the equation.

A major present constraint to serious thinking about S/T cooperation is the ignorance both countries have of each other. There is little knowledge of S/T infrastructure, leadership, topics of research, etc., making it difficult for each country to identify specific areas in which it might be interested in cooperating. Alleviating some of this ignorance would be an important first step.

Mechanisms of S/T Cooperation

There are many mechanisms for initiating S/T cooperation. Rather than choose one to the exclusion of others, it would be preferable to begin with a large number of discrete initiatives of cooperation. As soon as some kind of green light is given after the conclusion of a treaty the initial phase could involve a series of activities ranging from arranged contacts such as seminars, lectures, visits and short-term exchanges to parallel and joint small-scale projects of applied research and development. These ad hoc measures should be judged pragmatically and techniques that work should be continued; those that don't could be set aside. Although there is the need for caution and for keeping the first efforts on a low key basis, a large quantity of separate activities involving a significant number of individuals would be desirable. Cooperation could develop from small, almost token beginnings, emphasizing the substance of the exchange rather than visibility.

The following are some of the mechanisms which have been suggested and could be used to begin the process of S/T cooperation. Details on specific sectors of S/T are provided in the sections which follow in the report.

- 1) Supplying information on S/T in each country. Because of the ignorance on each side of the technical studies and problems being dealt with by the other, providing specific and detailed information on Egyptian and Israeli research, institutions, resources, capabilities, and programs could be an important first step. Third party assistance might greatly facilitate this and the U.S. is uniquely qualified to take the initiative. The U.S. has access to some of this information from, for example, PL 480 projects in Egypt and could assist in assembling it in a number of ways. One suggestion is to dispatch small teams of consultants to each country to prepare descriptions of research activities. However, the wealth of information possessed by the science attaches in Cairo and Tel Aviv and by the National Science Foundation may make this unnecessary.
- 2) Visits and exchanges. These could begin on an unofficial, almost tourist basis, or with individual visits to attend meetings, seminars and conferences. Some would be information visits, to develop relationships and contacts and make acquaintances with the other country. Eventually, exchanges of researchers, professors, students and public sector specialists should become possible. The important thing is to begin a free flow of people in many different fora and institutions. A relatively small amount of U.S. funding could facilitate such visits.

3) Funding parallel research projects and developing S/T capability. Providing financing and support for independent but related research activities in Israel and an Arab country could be an important mechanism to prepare the ground for future cooperation. There may be many instances in the short term where Israelis and Egyptians share a common research interest but are not able to immediately begin collaboration, and this will be the case in the near future for Jordan and other Arab countries. Funding a research project in both countries with a similar research protocol could make some form of subsequent communication and cooperation natural and mutually desirable. Varying degrees of overtness are possible. At one extreme, the projects could begin totally independently with no contact made for a year or so or until it becomes politically feasible. Alternatively, meetings could be held in the U.S. to discuss project arrangements and results. There are a number of possible modes which could be altered to fit the particular circumstances.

Developing the S/T capability in a country in a field of common interest also could facilitate future cooperation. This would be especially true where cooperation would not be welcomed in the short term because of imbalance in capabilities or institutions or where it is not yet politically feasible.

A number of areas where both these mechanisms could be applied have been identified in different sections of this study. There is a question, however, of the acceptability of funding projects or institutional development in a given country from a "regional fund" or with an understanding that some kind of regional cooperation is ultimately envisioned. This could be a problem with countries that have not yet normalized relations with Israel, but it may largely be an issue of presentation.

4) Funding Joint Research Projects. Joint research projects on topics of common interest could take place in a wide variety of ways. They could, for example, involve Israelis and Egyptians working in each others institutions, in U.S. institutions, independently with frequent contacts, or in a number of other modes. The availability of funding would be likely to generate many proposals for joint projects.

5) Joint seminars, conferences, workshops. There are many possibilities for meetings to explore research needs and plans and provide a setting to make initial contact, suggest courses of action, and so forth. They could be held in

the U.S. or another third country, under third party sponsorship or perhaps have alternate sessions in Egypt or Israel. A variety of institutions could organize such meetings and the range of potential subjects and arrangements is wide.

Some observers have stated that the Egyptians would be unwilling to devote initial meetings to seeking topics for cooperation. They would prefer that these be limited to on-going or newly proposed research and development useful to Egypt. Other observers disagree and argue that meetings even on specific, shared problems would not be likely to lead to cooperative ventures; what is needed are workshops on how to approach and obtain regional cooperation which only incidentally address the substantive subjects. Both methods could be tried, probably under different organizational sponsorship. In either event, the involvement of Egyptian and Israeli scientists who are intimately acquainted with the research and institutions in their specialities would be essential to advance S/T cooperation. Additional meetings without their participation are unlikely to be specific enough to further increase our knowledge of possibilities.

6) Generating proposals. It is difficult even for an informed and technically competent observer to uncover specific S/T needs and possibilities. A request for proposals on specific areas of S/T cooperation would be likely to elicit a wealth of suggestions from the U.S., Egyptian, and Israeli scientific communities if the availability of funding were made known. This would be useful only after the basic guidelines and institutions for S/T cooperation have been decided.

Institutional Arrangements

Many institutional arrangements are possible and a diversity of mechanisms should be encouraged. A large number of U.S. organizations - universities, the National Academy of Sciences, the National Science Foundation, the American Association for the Advancement of Science, professional societies, foundations - have the interest, capacity and experience to promote Arab-Israeli cooperation. Many of these organizations have worked with Middle Eastern countries and some have a close acquaintance with Egyptian and Israeli S/T. They could assist in many different fashions in numerous substantive fields and provide a wide array of approaches, mechanisms, and experience to choose from for any particular situation. A number of these organizations already are taking initiatives of various kinds and others undoubtedly

will be after the signing of a treaty. The U.S. Government could greatly assist this process by making funding available.

Within the U.S. Government, a number of agencies, including USDA, HEW, EPA, and the National Science Foundation are involved in S/T programs in Egypt through special foreign currency program support of Egyptian S/T. They also have some involvement in Israel through the U.S.-Israel Binational Science Foundation. Through these activities the agencies have become familiar with the S/T establishments of both countries and have a great deal of information on various disciplines. They also have gained valuable experience in evaluating proposals from the region. Other U.S. Government agencies not involved in these programs also may have special expertise and Middle East experience in some sectors and could be directly involved in the institutional arrangements.

Although a broad-based, pragmatic approach involving many discrete initiatives seems indicated, some kind of overall coordinating body would be extremely useful, especially at a conduit for U.S. government funding and assistance. A bilateral or trilateral commission on cooperation could devote a sub-commission or section to S/T cooperation. If, however, such a larger, more visible commission were not acceptable to the parties, a lower key, smaller commission or committee on science and technology might be possible. A commission could have a wide range of degrees of visibility and size, from a small group of a few academics to a formal commission with ministerial level government participation. It also could be either bilateral or trilateral; given the widespread Egyptian belief in the need for U.S. participation and the desirability for involvement of the U.S. scientific community, a trilateral approach would appear to be more feasible.

A commission could assist in making contacts and arranging projects, an important function for countries which have never been in contact. It also would give an official sanction to exchanges and provide some measure of direction on the nature and scope of S/T cooperation. Most importantly, it would provide a central funding source for cooperative S/T activities. The availability of U.S. funding would be both an impetus to setting up a commission and a major rationale for its existence.

A commission could be the main implementing body for S/T cooperation and would be in a position to plan the precise strategies to be utilized. It would arrange contacts,

organize meetings and conferences, fund research, and so forth. Since the commission would draw from the scientific communities of all three countries, it should be able to plan these activities far better than a group in the U.S. could. The commission might provide grants for research using criteria similar to those of the U.S.-Israel Binational Science Foundation. Proposals for research would have to be scientifically sound and involve some Arab-Israeli cooperation in a problem of mutual concern to both parties.

The commission could have its own secretariat but more likely would utilize existing organizations in the three countries. The scientific academies in each could be good candidates for this. The U.S.-Israel Binational Science Foundation; the National Science Foundation; and other organizations also could play a role. The U.S.-Egypt Joint Working Group on Technology, Research, and Development, although not an operating entity, might also be utilized.

If a commission should prove not to be feasible, some kind of coordinating unit in the U.S. would be needed. While many different activities would be desirable, an organization to serve as a single conduit for U.S. Government funding would be desirable for coordination and management. The signing of a treaty and spread of the word that A.I.D. funds earmarked for regional cooperation were available would likely stimulate a large number of proposals for meetings and projects in S/T cooperation. Many of these proposals might merit consideration, but they would have to be carefully screened. A grant could be provided to an appropriate U.S. organization to arrange meetings, fund research, and generally plan encouragement of S/T cooperation subject to U.S. Government policy guidance. Such an organization would have to have strong links with the Egyptian, Israeli, and U.S. scientific communities and be able to quickly gear up to mount a significant effort. The National Academy of Sciences is an example of the kind of organization that would be required. Even if a commission did prove to be feasible, locating such a U.S. organization might still be necessary, as it might serve as the U.S. leg of a commission.

It also would be possible, particularly if a single organization could not be located, to make several grants to different science organizations, universities, and government agencies for promotion of cooperation in various disciplines. This approach would have the advantage of diversifying the effort but would make overall direction and coordination more difficult.

Regional Institutes

The establishment of specialized regional institutes is often suggested as a particularly useful means of bringing Arabs and Israelis together to work on common problems. Numerous subjects have been suggested for institutes of various kinds. Among these are arid-land agriculture; solar and other renewable energy sources; several aspects of health; meteorology; transport; language studies; water sharing; archeology; marine sciences; West Bank development; manpower planning; and others. A number of these are discussed in the individual sections on different sectors of cooperation. There also are proposals for an institute to deal with the overall problems of regional cooperation. The Tel Aviv University Peace Project, for example, has proposed an "Institute for the Study of Peace and Regional Cooperation," as a binational institution with, perhaps, the University at Cairo as a partner.

Suggestions for institutes generally relate to problems of real importance to the region, but they often are made without reference to currently existing organizations. Most of the problems, precisely because they are of interest and concern to the countries involved, already are an object of some kind of inter-Arab and/or national organization. However ineffective some of these groups may be the same difficulties might well be faced by a new institution which has Israel participation. Consideration must be given to why a problem is not being effectively dealt with in a regional organization; the lack of success may indicate that the issue would be better faced on a national basis. Attempting to solve a problem by creating another regional institution has been a common practice in the Middle East, but it generally has not been an effective solution.

Institutes can require years to be established and begin to produce. They also can use up a great deal of available resources in the process. Building ties between existing Arab and Israeli institutions and developing common research projects may be an easier and more efficient method. Israeli membership or some kind of observer or participant status in Arab regional organizations in which Israel would have a particular interest also would be effective, but would be subject to the problems discussed in a preceding section. Caution should be exercised in advocating a new institute until the need and relevance of one is carefully investigated.

New institutes could however, offer an excellent focus for Arab-Israeli cooperation. They would have considerable symbolic value as a concrete demonstration of cooperation on common problems and be a useful instrument for channeling U.S. and other assistance and funding. They also could begin on an Egyptian-Israeli bilateral basis with a clear opportunity for other countries to participate when that becomes politically possible. Because of their visibility, however, institutes may not be feasible in the first phase of cooperation. After relationships between individuals and institutions on the basis of common needs and interests have been established they could be a good second step. The availability of U.S. support and financing, and perhaps affiliation with a prestigious U.S. institution, could be strong inducements.

Either Egypt or Israel could be a location for an institute. Egypt might have special advantages since eventual inclusion of other Arab countries would be easier if the institute were not located in Israel. The Sinai is sometimes mentioned as an ideal site, both for its midway location and the relevance of many topics of common interest to the development of the Sinai. Egyptian sensitivities on Israel involvement in the Sinai, however, and its distance from Egyptian urban and academic centers, suggest that it should not be considered initially.

One proposal is to establish institutes in areas of interest open to all regional countries with which the host country has diplomatic relations. Amman and Cairo are suggested as locales for institutes dealing with desertification, appropriate technology, and health, although other locations and subjects would be equally possible. This would allow institutes to be created now with Israel brought in as diplomatic relations are established in the future. We do not believe that it would be worthwhile to set up a new institute on this basis unless there is a clearly defined need where no other organization exists. However, in some instances, supporting the development of existing national and inter-Arab organizations in certain key areas, like arid-land agriculture or health, both to upgrade capabilities in these fields and to facilitate eventual joint programs with Israel organizations and individuals would be desirable.

An institute that would study the possibilities of regional cooperation, of bringing Israel into the regional economy, and relating to the Arab States could play a

valuable role in facilitating the normalization of relations. It would allow Israel and Arab thinkers to examine each other's views, needs, and interests in an environment specifically geared toward the study of the problems of peace. This kind of contact might help head off some of the problems that could arise from the mutual ignorance of decades of isolation. The institute could be formed as a formal tie between universities or other institutions like the Shiloah Center in Israel, and the Al-Ahram Center in Egypt. It also could be a new organization created for this purpose.

Costs

It is impossible to estimate precise funding requirements for S/T cooperation at this time. They could vary from token amounts to substantial sums. A small grant for an Israeli professor to visit Cairo would be only a few hundred dollars; a major collaborative research project or regional institute could involve several million. Providing a grant to a commission or to one or more U.S. organizations would be sufficient to begin the process. Further funding would await the results and findings of this first step.

The remainder of this chapter discusses cooperation in a number of fields of S/T. Some of these overlap considerably and the distinctions between disciplines are in some cases arbitrary. S/T is used in a very broad sense, including such fields as education, health, social sciences, etc. Some areas, such as agriculture, are included under S/T because most of the potential for cooperation lies in research and information sharing rather than infrastructure projects.

The general treatment of S/T cooperation presented in this overview is designed to provide a broad framework for any kind of S/T cooperation. The discussion of philosophy, approaches, mechanisms, institutions, and so forth normally applies to each area of S/T and will not be repeated in each section.

B. Health

Summary

Nutritional problems, infectious diseases and chronic degenerative diseases figure prominently among the major health problems of every country in the Middle East. In all of the countries of the region, disparities in income, educational levels, housing conditions, and cultural conditions also have a significant impact on health status. Each country deploys varying levels of resources to cope with needs found in their health sectors.

The Office of International Health, U.S. Department of Health, Education and Welfare, conducted a review of common health problems and capabilities in the region. The study identified four general areas in which cooperation would be fruitful, each containing one or more specific project ideas. These are areas of particular interest to Egypt and Israel and in general are ones in which Egypt has a strong capability. The HEW analysis also identified regional institutions involved in these fields, for further contact. The areas of possible cooperation include:

1. Biomedical and Environmental Research and Development;
2. Information Systems and Epidemiological Surveillance;
3. Professional Development; and
4. Health Services Research.

Background

The most widely used indicators of health conditions in a society are life expectancy, the infant mortality rate and the crude death rate. These indicators, as available for the countries of the Middle East, are presented in the following table:

Health Indicators for Selected Countries
of the Middle East

Country	Life Ex- pectancy at Birth (in years)	Infant Mortality (per 1,000 Live Births)	Death Rate (per 1,000 Population)
Syria	57	93	15
Lebanon	64	59	10
Israel	72	22	7
Jordan (East Bank)	57	86	15
West Bank	n.a.	10-45	n.a.
Gaza	n.a.	79	n.a.
Egypt	52	116	12
Saudi Arabia	45	152	20

Sources: For West Bank/Gaza, Government of Israel, 1975; for all others, Population Reference Bureau, 1977 World Population Reference Sheet.

The limitations of these figures should, of course, be appreciated. The numbers are the products of imperfect information systems. They represent more or less adequate estimates rather than exact measurements. They also fail to reflect health status differences within the national populations. The Israeli figures do not reflect, for example, reportedly significant differences in health status between those components of the population of European and non-European background. In the Arab countries, health conditions among middle and upper-income segments of the population reportedly approach industrialized country standards.

Common health problems include infectious diseases such as bacillary dysentery, tuberculosis, infectious hepatitis, and measles; and nutritional problems, particularly related to women and young children. Chronic degenerative diseases such as cancer, hypertension and heart disease are believed to be increasing in the region but good data are not available for all countries.

The exact configuration of health sector resources in the region varies from country to country. In nearly all cases, though, some mix of public, private and military-based service delivery patterns is found. Perhaps the most common characteristics of the region's health service delivery pattern are a strong orientation toward physician-based services, with little dependence on auxiliary health manpower, and a skewed distribution of these physicians in favor of the cities, with rural areas tending to be badly underserved. A serious manpower problem in the region lies in the scarcity of nurses and other non-physician health manpower, such as laboratory technicians and medical equipment maintenance personnel.

However, there is considerable variation in national health problems among the countries in the region.

In Egypt diseases of the digestive system are the leading cause of death, followed by diseases of the respiratory system and then disease of the circulatory system. More than twenty percent of the deaths are from undiagnosed causes. Mortality of children under five is around 50% of all deaths in the population, a pattern often found in LDCs. Data suggest that over half of the deaths of infants occur from diarrheal illnesses. Schistosomiasis also presents a serious health problem in Egypt, both in terms of the direct effects on its victims and of the weakening effects leading to other disease consequences.

In Israel the causes of death reported to the World Health Organization include some infectious diseases and high rates of cardiovascular diseases, malignancy and accidents.

Health services in the West Bank are provided at government and nongovernment clinics and hospitals, and at UNRWA health units. Specialty cases are referred to hospitals in Israel (e.g., cancer, eye diseases, heart, and other major surgery). Cooperation between Israeli, U.N. and private voluntary health efforts in the West Bank

has been reported to be a problem. Disease patterns are similar to those in Jordan and Syria, where the burden of illness falls heaviest on the youngest segments of the population. There is high incidence of diarrheal disease, chickenpox, measles, mumps, and pertussis among children, and high levels of eye disease (trachoma) throughout the population.

Findings

There are differences in the health needs of Israel and the Arab countries, but a number of areas where cooperation appears feasible have been identified.

1.) Biomedical and Environmental Research

The most promising projects for regional cooperation are in this field, particularly between Egypt and Israel. Both countries have an interest in schistosomiasis research, and in the health effects of pollution of the seas.

A. Research on schistosomiasis is now underway at both the Weizmann Institute in Israel and the Biomedical Research Center for Infectious Disease in Cairo. Both centers are part of a worldwide biomedical research center network funded by the Rockefeller Foundation, and working arrangements between these centers already have been initiated. Therefore, U.S. Government support for this program could be undertaken immediately. Since schistosomiasis also has been identified in Jordan and Syria, it might be possible to also include institutions from these countries in a U.S. funded program of exchange of information, and expansion and coordination of research programs.

An extension of this same theme to a wider regional cooperation through a new institute to engage in the study of parasitic diseases characteristic of the Middle East might be a long-range consideration. U.S. provision of exchange faculty, equipment, etc., for such an institute might be appropriate.

B. A program of studies to evaluate the hygienic aspects of marine pollution with particular reference to the protection of bathing beaches is another promising area for cooperation. The following specific joint studies

- Epidemiological study of the risk of bathing in sea waters with varying levels of microbial pollution.
- Studies on the diffusion and die-away of enteric pathogenic bacteria and viruses in the Mediterranean.

The High Institute of Public Health in Alexandria, Egypt, in cooperation with the U.S. Environmental Protection Agency, has been working in this area for the last two years. Their work could be continued and expanded to include Israel.

2.) Information Systems and Epidemiologic Surveillance

A. Establishment of a Border Health Commission could be a valuable long-term effort, with the objectives including:

(1) to promote the development of cooperative actions to better the understanding of needs and health problems on the border areas;

(2) to serve as a mechanism for communication and collaboration between responsible health agencies in the member countries.

One possible model for such an association is the U.S.-Mexican Border Health Association, created in 1943.

B. Israel, Egypt, the U.S. and several other countries have participated over the past two years in an international health planning information exchange project sponsored by the U.S. Department of HEW and the World Health Organization. Both Israelis and Egyptians have shown interest in extending these exchanges into more formalized information system linkages. Some U.S. technical assistance and equipment could be utilized to create a system for usage of the data by the appropriate organizations and institutions within each country.

3.) Professional Development

The initiative here would involve the establishment of regional associations of professions/scientists/paramedical personnel to increase communication and training

exchanges among the health/medical community and to broaden knowledge about the region's health problems. U.S. institutions/organizations could be utilized to stimulate development of such associations. Appropriate professions for attention include public health, hospital administration, nursing, midwifery, laboratory technicians, medicine, and water and sanitation. Such organizations also could serve to promote key health issues such as family planning and population policy which may be too sensitive for direct project cooperation in a regional context at this time.

4.) Health Services Research

A. Given the large expenditures on pharmaceuticals by the countries in the Middle East and the general lack of data in this field, research leading to improved production, marketing, prescribing and utilization of drugs may be of multi-country interest.

B. Major nutritional problems exist in the Middle East, particularly nutritional anemias in women and young children, under-nutrition of weaning age children, and over-nutrition in affluent groups. Cooperation in solving these problems should include emphasis in service delivery, research, and training of personnel and education through the use of the mass media.

C. The dry environment of the region, particularly the populated areas on the edge of the Levantine deserts, causes a high incidence of eye diseases such as conjunctivitis and trachoma. More needs to be known about the extent and causes of this situation, but in general such conditions can be easily treated with proper training of health delivery personnel. There are several U.S.-based international organizations, such as the International Eye Foundation and Helen Keller International, which might be interested in collaborating on research and in developing training and public education programs.

C. Agriculture

Summary

The Middle East countries face common problems and development experiences in agriculture and have had varying degrees of success in their agricultural development. The region could benefit from cooperation in agriculture by: (1) sharing information about past efforts; (2) cooperating on new research; (3) providing technical services in development projects; and (4) planning development programs and projects in a manner which allows further specialization for both internal and external markets. These opportunities generally are of a service nature to farming or agricultural marketing operations. The exception may be development, planning, and provision of services or investments in food processing facilities in the Jordan River Valley, as the area is limited and divided in such a way that it is inefficient for all the interested parties to pursue separate development programs. Possibilities for jointly owned or operated projects appear very limited in the near term.

Background

The countries directly affected by peace settlements in the Middle East all have food deficits stemming from poor endowments of good agricultural land, or water, or both. The countries have attempted to maximize their returns of scarce resources by the use of modern technology and by producing specialized crops for export and importing agricultural products such as cereals and feed grains which are land intensive and thus more economically imported.

Demand for food products and new agricultural services is growing rapidly in the region due to: (1) natural population increases, particularly in Egypt; (2) increasing family incomes in the range where people shift from a cereal based diet to one with a broader variety of other foods; and (3) increase in tourist trade and urbanization which require both higher quality foods and a wider variety. The 1977 agricultural trade deficits, in millions of dollars were: Egypt 839, Israel 253, Jordan 193, Lebanon 125, and Syria 42.

The increasing demands for food are imposed on an area with relatively limited land and water resources. However, the constraints are not uniform. At the present time Egypt has more than sufficient water for its present flood irri-

gation systems and its currently developed agricultural area, and in fact overuses water to the detriment of its land and aggregate production. Egypt's potential lies in using its present water and land more efficiently and developing new lands effectively. New land development would require new irrigation technology as well as better settlement organization and management.

With the exception of Egypt, water is the major agricultural constraint in the region. The opportunities for increasing agricultural productivity are in planning and executing agricultural development programs and projects in a manner which can effectively use the scarce factor - water. The traditional flood irrigation techniques are giving way to the water conserving drip, trickle and sprinkler systems. Productivity with these systems must be maintained at a high level to justify their high capital and operational costs. Maximizing returns for the areas's farmers would require long range planning in which various local and export markets for agricultural products were considered against the productive resource base, with its potentials and constraints. Presently there is limited effective planning nationally and almost none regionally. As a consequence there is a scramble for land and water resources and the export markets.

Regional cooperative efforts must recognize: (1) that the nations presently produce export crops which are in competition with one another, i.e, cotton, fruits, vegetables and flowers; and (2) that markets for specialty crops are limited, particularly since many nations are trying to sell produce to Western Europe, the principal market for such production. Export markets are perceived to be the most profitable so cooperation on export crop opportunities obviously would be limited to those areas where it can be demonstrated that specialization is to mutual advantage. The general strategy of moving to high value/high profit crops is an appropriate one but it requires accurate planning and execution in order to (a) justify higher capital and production costs for speciality crops, and (b) gauge production so the market isn't glutted with perishable commodities. This planning is critical on a national basis, and regional cooperation also is essential for the strategy to succeed for the maximum benefit of all parties.

The Arab Organization for Agricultural Development which is charged with promoting regional and national projects, as well as helping differentiate regional production and marketing

potentials, has not had notable success, as national interests have predominated. High levels of productivity and standards have been achieved for Egyptian cotton, and rice production levels also are high. Israel, with its more integrated type of agriculture and processing and the use of relatively "high technology" in all areas, has established high physical levels of production and maintained high quality standards for export crops.

It would be useful if the countries of the region could share information and technology, as there are less than optimal investments and use of supporting infrastructure in the area as a whole, i.e. Israel has a relatively complete and well staffed research and extension network for a small agricultural economy whereas other countries have less investments in such services for their larger agricultural sectors. Meeting domestic food needs are an important requirement and doing this in an efficient manner will require major efforts irrespective of export markets. There are major domestic needs for cereals, meat, milk, and oil crops and potentials exist for increased production but the value of such crops can not support high cost water or excessive investment in other infrastructure.

Findings

Agriculture is a promising field for Arab-Israeli technical cooperation. The Israeli experience and success in developing agriculture in the Middle Eastern environment, along with the common problems in arid land agriculture faced by all the countries, make this sector appear a natural for cooperation. Israel has great reservoir of technical expertise in agriculture and experience in providing technical assistance developing countries. The Arab countries have a growing technical capability but could use assistance in many areas. The need for caution discussed in the S/T overview applies here, however. Israeli technology is good but generally not unique and the Arabs do not have to turn to Israel for their technical assistance requirements. In fact, many of the areas commonly suggested for regional cooperation are the subject of current USAID programs in Egypt and Jordan. The existence of similar agriculture environment and problems does make cooperation of potential mutual benefit to all parties but is not absolutely necessary for either side.

Arid Lands

The development of arid lands in a number of regions is a major goal in Egypt and technical assistance in all

aspects of arid land development is needed. Israel experience in the Negev is generally applicable to those areas, such as the Sinai, where water resources are severely limited and in areas where similar soil types exist and where non-flood irrigation is required. Considerable research on the subject is being conducted by both countries and the potential for exchanges of information and cooperation in research are particularly good. Arid land development in Egypt has two separate aspects: (1) further development of several areas adjacent to the Nile delta and southward along the Nile, which are only partially developed; and (2) proposals to initiate development of raw desert land located on both sides of the Suez Canal, Sharkia Governorate, New Valley and on the edge of the Delta. Development problems and needs differ significantly for these two categories of land. There is difficulty in making economic justification for transporting Nile water any distance from presently populated regions for agricultural purposes, i.e. the edges of the Delta or Nile Valley. This is because the soil types are generally poor in all cases and therefore advantage should be taken of existing markets, infrastructure and services since plant nutrients would likely have to be totally added to the land yearly.

Areas that are now partially developed need additional capital to complete drainage facilities and other infrastructure, and technical assistance to determine appropriate land and water management practices, cropping patterns, and organizational arrangements to achieve viable agricultural systems.

The Egyptian government has sought such assistance from foreign firms, but thus far has not been successful for a number of reasons. However, Israel has had substantial experience not only at home but in other parts of the world in implementing such development projects. A joint venture between one of the existing Egyptian farming companies and an Israeli firm to complete the development process might be beneficial. The results from such a cooperative undertaking would have much wider application to other partially developed areas as well as for new lands being considered for development. Israel also could contribute substantially to the identification and planning phases for raw land development. Detailed soil and cropping studies will be needed to determine their potentials and to establish priorities for capital investment in water delivery systems, drainage and other infrastructure.

Israel has done extensive research on salt tolerant crops at the Negev desert research center, and reportedly has compiled significant data on the Sinai which it presumably would be willing to provide to Egypt. However, joint projects in the Sinai may not be possible in the near future due to Egyptian sensitivities.

The Jordan Valley

The Jordan Valley consists of about 51,000 hectares of potentially irrigable land with a year round growing season. About 30,000 hectares are on the East Bank and 21,000 on the West Bank. The main water sources for the western area are the Jericho and Wadi Far'i springs, plus the deep wells and the winter flows of the Jordan River which are being developed by Israeli settlers. The water sources for the eastern portion of the Valley are diversions from the Yarmuk River and control of run-off from several side wadis. As water is the limiting factor for development of the Valley there should be an integrated plan for its use. There are considerable water use and production efficiencies to be gained from use of drip irrigation rather than the flood or sprinkler systems currently utilized, but this may require reallocations of existing water for leaching requirements. Thorough investigation of ground water resources and their use, or conservation should be done to determine how that water fits into a total integrated water use and drainage plan (see Chapter VI for additional comments).

A project for the Valley might start with a task force to survey, in detail, the natural resources base, existing development efforts, market potentials and other factors that might identify where gains could be made from cooperative efforts. A comprehensive water use and crop production plan would help to identify the subsequent investments needed in marketing and processing facilities, research and extension networks, and other support infrastructure that would avoid possible duplication.

Research and Planning

The following are a number of areas of common interest in research, training and development planning in which cooperation appears to have particular potential. The list could be expanded.

1. Development of forage plants tolerant to saline waters, and other crops which have low water requirements and which

can tolerate marginal soils. Very good drainage and leaching systems would, of course, be required. Egypt has a strong interest in this subject. Israel has had considerable experience, and it is of interest to all the Arab countries. Research is underway on arid-adapted plants having industrial potential such as joba, guagule, and euphorbiacea. There are indications of interest in this in Egypt and work is being done at Ben Gurion University. The University of Jordan also is interested.

2. Research on developing desertification containment measures such as dune stabilization, reforestation and afforestation, and range management. Extensive work has been done in Egypt on various techniques for controlling desertification, and Israel and Jordan also have been active in this area. Opportunities for cooperative research efforts range from information exchanges to full scale regional programs aimed at desert containment measures. Support of the Desert Development Demonstration and training program at Abees would be a good way of developing Egyptian research capabilities in many of these areas.

3. Cooperation in the development of aquaculture. Both Egypt and Israel have a great deal of interest in this subject and Israel has developed some of the most sophisticated aquaculture techniques in the world. There are numerous areas where exchanges of information and cooperative research and training would be valuable. The use of brackish waters for aquaculture is an area of particular potential; it is of interest to all the arid nations of the Middle East.

4. Cooperative efforts in design, installation, operation, maintenance, repair, general management and, perhaps, manufacture of sprinkler, drip and trickle irrigation systems. These systems require better management in water application, soil management and drainage than is generally found in the region, yet all countries have some experience. The systems are water conserving, a critical requirement now which will be even more important in the future.

5. Cooperative efforts in agricultural development planning. Cooperative efforts in establishment of common agricultural statistics, data and standards would be useful in support of longer-range objectives of development planning. The size of both the total market and the production base, with all its constraints, suggest that greater degrees of specialization should take place. This can best be accomplished by free

flows of accurate information, technology, production inputs and final products between countries of the region.

Arab organizations, such as the Arab Organization for Agricultural Development and their organization for product standardization are working in this area but progress has been slow. Israeli experience in this subject might be useful.

Regional Institute

Because of the existence of common agricultural problems, arid land agriculture often is suggested as an ideal subject for a regional institute. As discussed above in the general section on institutes, however, there already are numerous centers and other institutions doing work in this area; the Arab Center for Studies and Arid Zones and Dry Lands (ACSAD) is a prominent example. The need for yet another organization would require careful evaluation. Establishment of links between Israel institutions and Egyptian and eventually other Arab centers might be an easier and more effective mechanism. It also might be possible to integrate Israel into ACSAD or other regional organizations at some point following peace. The usual political problems of bringing Israel into this kind of organization might be countered by the particular expertise that it could provide. The new International Center for Agricultural Research for Dryland Agriculture (ICARD) with headquarters in Beirut and a major field station at Aleppo offers a possible framework for beginning collaboration.

The importance of this area, however, may make the establishment of a new institution worth exploring. Work on limited resource areas such as the Sinai might be a starting point for such an institute. Locating the institute in the Sinai, perhaps at Al-Arish, would meet both Egyptian and Israeli research needs, although it would be somewhat removed from Egyptian population centers. U.S. participation would be beneficial because of U.S. expertise in the subject area. Israel also has expressed a willingness to convert its Negev research center into a regional organization and that would be another possibility. The Institute also could go beyond research and address some of the problems in regional agricultural planning and marketing.

D. Marine Sciences

Summary

Many aspects of the marine sciences constitute a natural area for regional cooperation, particularly when they involve common bodies of water. The Gulf of Aqaba, with long borders on Saudi Arabia and the Sinai and short but important coastlines on Jordan and Israel, is an excellent example of a shared natural resource. Small and threatened, the Gulf requires cooperation among the littoral states for its preservation and optimal development. The National Oceanic and Atmospheric Administration (NOAA) has identified a number of possible projects in this area. Cooperation in pollution control, fisheries, and other areas would be completely substantive, with clear benefits accruing to the parties. There are only limited opportunities for further specific Arab-Israeli cooperation on the Eastern Mediterranean outside of the present multilateral framework.

Background

The Gulf of Aqaba is a narrow (14-20 kilometres wide) finger of water extending 180 kilometres from the intersection of Jordan, Israel, and the Sinai to the Red Sea. It forms a part of the Great Rift Valley system. Most of the western littoral of the Gulf will revert to Egyptian control after implementation of the peace treaty. Israel has about 10 kilometres of coast surrounding the port of Eilat and Jordan has about 27 kilometres around Aqaba. The remaining eastern portion of the Gulf is Saudi Arabian.

Almost all major industrial development in the Gulf is concentrated around Eilat and Aqaba. This presents a classic case of multi-use conflict, with rapid industrial development vying with a growing tourist industry largely based on the attractions of a relatively pristine marine environment. Eilat has major port and phosphate loading facilities and receives large amounts of Iranian oil both for Israeli use and shipment to Europe. Aqaba is Jordan's sole port, has grown rapidly, and is the shipping point for Jordanian phosphates. Both the Israeli and Jordanian sides have important tourist facilities and there is considerable potential for further touristic development along the Sinai coast.

There already is some pollution from small oil spills and the danger of a catastrophic major spill clearly exists. Other sources of pollution include phosphate pollution from phosphate loading operations, salt brines from desalination plants, municipal wastes, and others. These pose a serious threat to the marine environment of the coast.

The fishing potential of the Gulf is largely unknown and fisheries have not been developed to any great extent.

Israel has a good marine science facility in Eilat. Jordan is developing a center under the sponsorship of the University of Jordan and Yarmouk University.

Findings

Regional cooperation is required to deal effectively with these threats to the Gulf's environment. There is no need to consider the symbolic or political benefits of cooperation in this field; the concrete benefits to all the parties should be sufficient justification. Cooperation could begin with independent but related programs in Jordan and Israel, or bilateral cooperation between Egypt and Israel with a clear possibility for ultimately including Jordan and Saudi Arabia.

Three kinds of programs are needed: 1) research on the sources, extent, fates, and effects of pollutants; 2) development of an environmental measurement system; and 3) development of strategies for reducing the flow of pollutants into the system, and for quick and effective clean-up operations when necessary.

While these activities could best be carried out cooperatively, they also could be initiated on a national basis. The National Oceanic and Atmospheric Administration has proposed developing independent but coordinated spill reduction and containment programs, carrying out research on the Gulf, studying and ameliorating phosphate pollution, and studying other forms of pollution. Particular assistance could be provided to developing Jordan's growing marine science capability to better enable it to participate in cooperative endeavors when they become possible. Assistance also could be provided to Egypt in developing a research capability for the Gulf as the Sinai reverts to Egyptian control.

The following project possibilities were identified by NOAA:

- 1) Assistance to Israel and Jordan in developing independent but coordinated oil spill reduction and containment programs.
- 2) Expanded research on the dynamics and characteristics of the physical, chemical, geological, and biological properties of the Gulf.
- 3) Oil pollution baseline studies and beached oil degradation studies.
- 4) Long-term hydrocarbon monitoring program.
- 5) Expanded program of research on phosphate pollution.
- 6) Design of environmentally safer phosphate loading equipment.
- 7) Studies of the effects of municipal and industrial wastes on the Gulf and a long-term monitoring project.
- 8) Assistance in the form of equipment and training to the Jordanian marine science laboratory.

The fisheries potential of the Gulf is not well understood. If a preliminary survey indicated the need, a comprehensive fisheries survey could be undertaken and mechanisms for management of the stocks established. This could be an Egyptian-Israeli project with Jordan brought in when politically feasible.

The Israelis are experimenting with mariculture in the Gulf and have developed highly sophisticated techniques. These could be of interest to Egypt and Jordan and, given the site specific nature of the activity, it would be a natural area for cooperation and sharing of technology.

The various aspects of regional cooperation in the Gulf indicate that this may be an area where a regional institution could be useful. An Israeli has proposed establishment of an Egyptian-Israeli marine science center on the border. This would be very near the Israeli facility,

which is cramped and requires expansion, and only a few miles from the Jordanian Center presently under construction. Although a border location might not be practical, a cooperative marine science center, perhaps along the Sinai Coast close to Eilat, would be an excellent focal point for cooperation in managing the Gulf. The project could be initiated on a cooperative basis by establishing an Egyptian center that could become regional. The institution could eventually cooperate with the Jordan facility and when politically feasible, evolve into a kind of Gulf of Aqaba commission which would regulate the exploitation and preservation of the Gulf's natural resources.

The Gulf of Suez and the Red Sea may have considerable potential for development but since they do not border Israel, they were not considered in this study.

The Eastern Mediterranean is another common body of water but it involves many other countries as well. There already is considerable cooperation in this area under the UNDP programs and Israel and the Arab coastal states are signatories of the Barcelona Convention. Cooperation on the Mediterranean specifically between Israel and the Arabs thus may not be necessary. A few problems, such as pollution from Egyptian sewer discharges and spills from oil shipments through the Canal, might have particular effects on these countries and would be good subjects for common research. Egypt and Israel also suffer from similar coastal zone erosion problems and could profit from joint research.

E. Meteorology

Summary

Problems of meteorology do not respect political boundaries and require cooperation between the countries of a region. International cooperation in meteorology has been developed to a high degree but regional cooperation in the Middle East has not developed to a point where there is meaningful day-to-day collaboration between Israel and her Arab neighbors except in some exchange of routine observations. Expanded exchange of meteorological information and cooperation in selected specific areas would be beneficial to the region.

Background

All of the states in the area have national weather services. The various countries are associated with three different regional groupings of the World Meteorological Organization (WMO) making true Middle East regional cooperation difficult at times.

There are a number of deficiencies in the national systems in various areas. These need to be corrected and some of the national systems would need to be improved to enable regional cooperation to take place effectively.

Findings

The opportunities for cooperation in meteorology to some extent involve interchanges that would be routine among nations that have normal relations. Linking Israel with the Cairo meteorological center and exchanging meteorological information on a routine basis would be an easily implemented project that could be undertaken early in the normalization process. There are a few other areas of specific collaboration that could be further investigated.

The National Oceanic and Atmospheric Administration (NOAA), in a preliminary report, has developed the outlines of a broad project for cooperation in the meteorological area, with the theme of increased food production. The overall program would be a long-range, broad-scale effort to upgrade the scope, quantity and timeliness of meteorological data acquisition in the Middle East and to develop and strengthen local capabilities in the collection, interpretation and dissemination of such information for increasing agricultural productivity and for improving agricultural planning as well

as increasing aviation safety, and improving service to industry and the general public, to cite only a few examples.

In order to establish a regional program, it would be necessary to upgrade Egyptian telecommunications and develop national programs initially through a series of national projects. These national projects could be undertaken separately as soon as the overall regional plan has been accepted and later melded into a regional program as each nation joins the program.

The national projects would be the "building blocks" of the program and would be based on country-by-country surveys of needs proposed to be carried out by a team to be recruited for that purpose. They will have in common: (a) the improvement of existing national networks of meteorological/hydrological measuring stations and selected expansions in existing systems to increase the quality and geographic scope of the data; (b) linking the reporting stations to national meteorological centers through new or strengthened telecommunications systems so that data can be reported, recorded and interpreted in "real time" (rather than later as is often the case today); (c) the establishment or strengthening of national meteorological services in each of the countries and the training of a cadre of professionals and subprofessionals in each discipline; and (d) establishment of data processing units at the national and regional levels for the interpretation and dissemination of meteorological and hydrological data in a form readily usable by the agricultural sector, for short term forecasts and to relay significant processed information to the regional center.

NOAA also has developed a program of climate and crop evaluation and assessment which could be useful in the Middle East. In this program, weekly assessments are made of climatic conditions and their qualitative impact on crops. This permits early detection of deteriorating weather conditions to permit appropriate early action to minimize potential adverse impact. A similar program could be developed for the Middle East. This program would begin in the United States with the aim of eventually transferring the operation to a regional center in the Middle East, probably in Cairo. This would be an easy program to implement and could be started on a country by country basis.

Another proposal is for an air pollution monitoring program on Mt. St. Katherine in the Sinai. There are a number of technical reasons why this location would be appropriate

for such a station but there does not appear to be any particular reason for Israeli participation. They are working in this area but have no technology to offer which is not available in the U.S. Given the Egyptian attitude toward an Israeli presence in the Sinai, this project is unlikely to be approved as regional, although Egypt might be interested in it on a bilateral basis.

Weather modification is another area of potential importance in the Middle East. A number of countries in the area are severely affected by limited or uncertain rainfall. Cooperation is essential in this area since the weather of neighboring countries is likely to be affected by modification programs. Israel has conducted considerable research in the field and cooperation would substantially involve the transfer of Israeli technology.

Due to the climatic conditions, cooperation in weather modification at present would involve only Israel, Jordan, Lebanon, Syria, and not Egypt. It is thus not possible in the current political context. In the longer run it is possible that substantial benefits would be provided by collaborating on the development of weather modifications, probably under the auspices of the WMO. The U.S. position has been that the WMO should assume the responsibility for the development of international programs in weather modification. In this case, the U.S. could provide assistance to what would be a truly regional project.

F. Education

Summary

Cooperation in education could consist of basically two kinds of activities: 1) collaboration on particular educational problems of interest to both countries, and 2) exchanges between educational institutions. Both areas have some promise, but the second has a broader scope and is closely related to exchanges in other fields of science and technology.

Background

All countries of the Middle East have given high priority to education in their national development process. Since the 1950's eradication of illiteracy has been a common major national goal. Countries of the region generally recognize the need to improve teacher education and training, to develop modern curriculums and to expand the physical plant of their educational institutions to create the skilled manpower required for national development.

Percentages of national budgets and GNP devoted to development, expansion and improvement of educational resources increased substantially. Expansion of educational systems at all levels, up through the university, often took place without adequate long-term planning, proper distribution of resources, or sound allocation of priorities in the attempt to make up for lost time.

Despite efforts by every country in the Middle East to improve education, disparities in achievement and differences in existing systems are so great that it would be difficult to discuss education in terms of a regional system. Morocco, Tunisia, and Algeria in North Africa as well as Syria and Lebanon have been strongly influenced by French traditions and organization in development of their school systems, teaching methods and curriculum. In Jordan, Iraq and Egypt, British tendencies outweigh the French. Among the countries of the Arabian Peninsula traditional Islamic-Arab trends often predominate. Education goals in the new socialist oriented republics frequently are difficult to accommodate with those in monarchies with traditionally oriented regimes and educational systems. Israel's educational system differs from all of these in many respects.

Little regional cooperation in education exists between the countries of the Middle East. To the extent that there is regional cooperation, it exists among the Arab states through ALESCO, the UNESCO regional center for education, and the UNRWA-UNESCO Institute of Education. Only the last of these three organizations has undertaken practical projects and programs. Other activities are largely at the discussion level, in the form of conferences and seminars. Egypt has been the most active country in developing regional programs for other Arab countries and for several African states. These activities, however, have been more in the form of assistance than cooperation, as Egypt, by virtue of its cultural and educational hegemony, has aided Muslim/Arab countries to develop their education systems. Israel, too, has had extensive experience in foreign aid related to education, mostly in African states.

Egypt is the major educational center of the Arab World and has had a pervasive influence over education in the Middle East. It dominates educational planning, curriculum development, technical and vocational education, formal and nonformal, and other fields, and most of all furnishes large numbers of teachers to many Arab countries. This experience, however, is specifically related to the Arab World and would have little to offer to Israel. The

difference between Israel and Egypt in social structure, literacy, levels of development, and culture as well as their sensitivity on education matters also would make cooperation difficult.

Findings

The field of education itself can be a delicate area and cooperation may involve more sensitivities than in other less-charged areas. The field of education therefore will probably not be one of the first sectors in which cooperation will take place. In addition, although Israel and Egypt do share some areas of common interest in education, the diversity of their educational systems, philosophies, and goals as well as their differing cultural heritages, suggest that cooperation at best will be limited. Exchanges in certain areas could be mutually beneficial, but Egypt's major focus of cooperation will continue to be the other Arab states.

A number of areas where cooperation might be possible, however, were identified by AMIDEAST, which conducted an evaluation of this sector for us. Cooperative activities that might take place within the general framework of S/T cooperation could involve conferences, exchanges of information and material, and other interactions to open contacts. All these suggestions represent fields in which both countries have considerable interest and useful experience:

- 1) improving teacher training in science and mathematics;
- 2) educating illiterates, an area where both countries have had significant experience;
- 3) technical and vocational education;
- 4) curriculum innovation; and
- 5) comprehensive secondary education, combining traditional and technical education.

Other areas of common interest in education could emerge as contacts develop between Egyptian and Israeli educationalists. For example, Egyptian materials and methods in Arabic language teaching and Israeli experience in education of women for development might be of interest.

In the area of general exchanges between educational institutions, on the other hand, cooperation could start

much more easily. It could take place on many levels and could begin quietly, avoiding controversial subjects. An initial step, as an example, could involve the exchange of book exhibits or film exhibitions, followed by visits of writers and film-makers involved with the books and films. Writers could visit scholars and others who have written about their works, and professors who are engaged in academic study related to the field could exchange short visits. This mode of opening contacts could apply to films, music, and many other areas.

Another field in which to begin contacts could be Middle Eastern history, and oriental and Islamic studies. In the early phases of exploration and discussion, the volatile issues of the modern Middle East would have to be avoided, but there are many excellent Egyptian and Israeli orientalist who are involved in the study of the pre-twentieth century Middle East. An exchange of ideas, materials, and researchers could open a useful scholarly dialogue. The vast wealth in antiquities possessed by Egypt and Israel also provides an opportunity for useful exchange in an area where both countries have considerable interest and expertise.

Cultural exchanges in various fields may be possible. Both Egypt and Israel have placed emphasis on developing national cultural institutions such as performing groups in dance, theater, and music which represent national themes and folk culture. These groups travel abroad regularly, and trips to Israel and Egypt could be routinely arranged.

Exchanges of teachers and students might begin on a small scale in selected areas. Initial exchanges of professors could be on a kind of mini-Fulbright program, and the first students probably should be graduate students studying in fields where the other country has strong institutions. There are areas, such as health and agriculture in Israel and Arabic studies in Egypt, where there could be substantive advantage in student exchanges and these could become routine.

The FY 1979 A.I.D. legislation earmarks \$1 million to finance scholarships for Israeli students to study in U.S. supported Arab institutions of higher learning and for Arab students to study in U.S. supported Israeli institutions of higher learning. The American University of Beirut (AUB), the American University in Cairo (AUC), and a few institutions in Israel qualify for these funds. It is unlikely that AUB would be able to accept Israeli students in the near future but AUC and some Israel institutions would be good candidates for student exchanges.

It would be helpful to have an organization assist in arranging educational exchanges. An overall bilateral or trilateral commission would be an appropriate instrument to do this, but in the event such a commission is not feasible a small regional committee on education could perform the task. Such a committee could be organized quietly and would consist of a few members of the academic and educational communities in each country. The committee could assist students and professors in locating appropriate academic programs and also could help provide funding; it thus could be the conduit for any U.S. financial assistance in this field.

Although the educational institutions of other Arab countries are not as extensive as those in Egypt, several - Jordan, Syria, and Lebanon - have well developed university systems and could participate in the same kind of educational exchanges with Israel when politically feasible. Opposition on the West Bank to educational exchanges is strong, but there could be opportunities for many kinds of exchanges if political conditions change.

While the establishment of new educational institutions is generally not recommended for the Middle East, two suggestions merit some consideration. One is to establish an institute for the study of Hebrew language and culture in Cairo, staffed by Israelis, and an institute for the study of Arabic language and culture in Jerusalem, staffed by Egyptians. These institutions would supplement work being done in both countries and provide an opportunity for direct contacts without students having to go to the other country. The institutes could be associated with the programs for teaching Hebrew at Ain Shams or Cairo Universities, and one of the Middle East Centers at an Israeli University.

The other suggestion is for the establishment of a university in the Sinai, near the frontier. Such a university is envisioned for a future period when relations have reached an advanced phase and Egyptian sensitivities on the Sinai have ameliorated. The university could be a high-level research institution. It would deal chiefly with common problems, particularly those relating to the physical environment of the Sinai, such as arid land development and desalination.

President Sadat has expressed a desire to establish a university in the Gaza Strip at an early date to provide higher education for the Palestinians there. A Gaza university would be much closer to Israeli population centers than Egyptian ones, and cooperation with Israel, if encouraged, could develop over time. Eventually, the Gaza university could evolve into a truly regional institution serving Egyptian, Palestinian and Israeli needs. This could be an opportunity for the U.S. to support a bilateral project now that ultimately could become regional.

G. Social Sciences

Summary

The study of opportunities for regional cooperation in the social sciences was conducted by two American social scientists familiar with the region. It focussed essentially on the research environments of Egypt and Israel, although the region does contain other active social science teaching and research communities (e.g., Jordan, Syria, Iraq). For both countries capabilities are extensive and well institutionalized, cooperative experiences with other nations have been demonstrated, and there are well-identified critical problem areas of common concern. Aside from modest Israeli/Egyptian contacts within the international community of behavioral science scholarship, however, little groundwork has been laid on either side for institutional and/or individual direct links. Fundamental structural differences exist between the two intellectual communities which must be coped with in encouraging relations.

Background

Two points must be considered in assessing Egyptian and Israeli social science resources. First, in Egypt all educational and research institutes fall within the state sector and the government influences educational objectives, research agendas, and operational procedures. In Israel there is seemingly a much greater degree of autonomous choice-making in terms of research areas and emphases in program building. This is important, since for Egyptians links outside of Egypt become a matter of political policy, and under the centrist system of Egypt, research institutes tend to be national and to pursue nationalistic scholarly objectives. In Israel, research capacities, located essentially in universities, are more diversified and are less fettered by governmental concerns and policies. Participation in regional cooperation, therefore, will be shaped by proximity to governmental controls and by differing notions of political economy. In both countries, however, despite structural differences, social science research has been seldom crucial or central to governmental policy-making.

Second, Israeli social scientists generally have profited more from sustained and constructive contacts with Western social sciences. This is seen in areas such as advanced training abroad, familiarity with current research

results, and participation in international scholarly events and interests. This asymmetry in relations with the international scholarly community is quickly being redressed by Egypt, as Egypt's economic "open door" policy has been extended to increasing links between Egyptian and American European institutions.

Findings

In many respects there is much potential for cooperation in the social sciences. For social scientists, many of the central concerns are those of analyzing and comparing structural and functional differences between societies. The striking dissimilarities between the two countries has long been a focus of interest for both intellectual communities. Regardless of sectoral concern, mutually beneficial cooperation between Egypt and Israel will have to transcend in some cases technocratic preoccupations.

Dissimilar socio-cultural systems and notions of political economy are two of the elements which can distance the two states. Better understanding of these differences could contribute to effective relations. When normalization of relations occurs, a favorable climate probably will be gradually created to continue and heighten the range of informal contacts which presently occur with a very low profile. It is conceivable that some of the most effective forms of interchange will be carried out not through formal public structures but through informal professional ties and commitments to principles of academic excellence. Cooperation in the social sciences would follow the general framework of S/T cooperation.

Eight areas of potentially important mutual interest were identified by the consultants for further consideration and development. Funding requirements to pursue these recommendations would be minimal. The areas are:

1. "New town" planning and administration. In Israel "new town" planning really tends to mean "small town", while Egypt's major effort at present is in the effort to create "new cities" and not "towns." Nonetheless, the general effort is similar enough to suggest meaningful cooperation.

2. Public Administration. In both countries there are large-scale and common complaints about the inefficiencies of the bureaucracy.
3. Social welfare services and improved delivery systems. Both countries have social welfare programs, but both the quality and especially the ability to deliver such services is a serious concern in both nations.
4. Urban density and services in older cities. Possibly the major complaint of Egyptians is the deterioration of Cairo and Alexandria under the massive onslaught of population pressures. While the problem is not nearly so drastic in Israel, there are similar kinds of concerns regarding Tel Aviv and Haifa.
5. Public and local administration. Both countries, for different reasons have had problems of local administration in rural areas. Likewise, their shared urban problems have a common aspect of weakness of local administration.
6. Management training and skills for the private sector. Both countries are at least nominally socialistic. In the case of Israel, there is, however, a large private sector. Egypt, on the other hand, is in the process of creating such a sector.
7. Relation of religious values to development. Both societies are characterized by an explicit religious spirit. The problem of the encounter of religious values and the modernization process is common to both nations.
8. Social science and cultural perceptions. Both countries have social science experts trained in the language and affairs of the other country. These persons ought to be put in touch with one another in the interest of furthering normalization of relations on an informal and possibly politically influential basis.

A number of problem areas do not appear to have potential for cooperation.

1. Communal relations.

The Copts in Egypt, and the Arabs and the oriental Jews in Israel represent significant separate and recognizably different populations in both countries. Even though the number of Arabs and oriental Jews in Israel is greater, and therefore perhaps a more major problem than is the case in Egypt, the issue is too sensitive politically to warrant attention in either country in the near term.

2. Rural organization.

Contrary to appearances, the major Israeli success at rural organization, the Kibbutz, is not transferable. The reason, based on Division of International Cooperation, Ministry of Foreign Affairs experience, is that the Kibbutz is largely a culturally unique phenomenon.

H. Other Areas

1) Remote Sensing

Summary

Remote sensing is a rapidly growing field that offers a good opportunity for regional cooperation. It is an activity which lends itself to regionalization and there is a clear need for remote sensing technology to provide information needed for the solution of some of the problems faced by the arid Middle East. It also is an area in which Egyptian capabilities are strong and, in some respects, ahead of Israel. There is considerable precedent for a Middle East regional center deriving from the regional remote sensing centers which A.I.D. has set up in other countries.

A regional center in Cairo established early in the normalization process would make a valuable contribution to the development of remote sensing in the region as well as begin cooperation in a field which both sides see as important.

Background

Remote sensing technology is of considerable interest to most countries in the Middle East. The threat of desertification, for example, is a significant issue and both Israelis and Egyptians have expressed interest in the contributions that remote sensing can make to understanding this phenomenon.

Egypt has the most advanced facilities in the region in the Egyptian Remote Sensing Center (ERSC) in Cairo and, in general, is ahead of Israel in this field. The ERSC was established in Cairo in 1971 by the U.S. National Science Foundation and has received A.I.D. support. It is well equipped for remote sensing analysis, having many advanced instruments for Landsat image enhancement and photographic reproduction both in color and black and white. It also acts as a user-services center where resource personnel can get expert advice on specific projects and where the latest imagery of the Landsat satellites can be obtained.

A.I.D. is establishing national centers in Damascus (which might involve Jordan) and Tunis, and Morocco is carrying out activities in agriculture and geology. Israel does not have an extensive well-defined center, but does have good equipment and is undertaking research on the subject. A number of Israelis have expressed a desire to work with Egypt on remote sensing.

The existence and development of national remote sensing centers does not preclude the establishment of a regional center, since the purposes of a regional center would differ considerably from those of the national centers. Regional centers do not provide equipment directly to the member countries and would not, for example, conduct a comprehensive resource survey of any one country. Rather, they provide training, tap all the U.S. and world resources in remote sensing, provide data on the tools for interpreting image data, make the various alternatives available to the members, and permit the members to better understand equipment needs and levels of investment for the national centers. Regional centers provide the same kind of training that is available at the EROS Data Center in South Dakota, but in the particular physical environment of the region in which it is located.

Along with European and Canadian donors, A.I.D. has set up regional centers in Nairobi (5 members); Ouagadougou (15 members); is developing centers in Bangkok (about 12 members); and will shortly be sending a team to Costa Rica. These centers are notable in that countries with current or past hostile political relationships are technically cooperating in making these centers viable institutions. There is thus ample precedent and experience for regional remote sensing centers and considerable expertise within A.I.D. in establishing them.

Given the interest in the region in remote sensing and the perceived benefits that further development of the technology would bring, the idea of a center should be actively explored. Cairo would be the preferred location because of the advanced state of Egyptian expertise and facilities, Egyptian interest in the subject, and the possibility of Israeli participation. Egypt would have to agree that the center is regional and that, although it would have final say in its development, control over all aerial photography flown to support the center, and control over all site visits in ground truth verification, the center would be operated regionally. Other sites in Egypt also could be investigated. Israel would not be as advantageous a location as participation of other Arab states would be precluded in the near future.

It might not be feasible to begin a regional center with only Egyptian and Israeli participation, but there could be a good possibility of certain other moderate Arab countries with a particular interest in remote sensing, such as the Sudan and Tunisia, joining at an early date. Cairo also envisioned at one point as an African remote-sensing center by the Economic Commission for Africa and this has been discussed over the past couple of years. African participation would allow the center to develop regionally, while waiting for other Arab states to participate. Since the present African centers do not have computer facilities, there might be considerable interest in joining the Cairo center which does have them.

The current model for developing regional centers utilizes four or five U.S. experts along with four or five local remote sensing professions to build the center over five years, with the U.S. role steadily declining over that

period. Given the advanced state of Egyptian activities in remote sensing, however, this level of assistance would possibly not be necessary. A.I.D.'s contribution in other projects has been around \$4 - \$6 million for equipment and U.S. personnel for the five years. This is a variable figure and total costs could range up to \$20 million with other donor funding.

The first steps in implementing this project would be to send an A.I.D. team to Cairo to evaluate the feasibility of a regional center and determine the best means of setting it up. This effort could be mounted quickly, once the green light were given.

There also is potential for Egyptian-Israeli collaboration on particular remote-sensing projects. Desertification studies and resource mapping of the Sinai/Negev area, for example, have been suggested as projects which could be better done cooperatively. These are good ideas which should be encouraged; they would be part of research cooperation in different sectors of S/T.

2) Appropriate Technology

Appropriate technology is a basic underpinning for all cooperative as well as developmental activities within and between the countries. The difficulty of divorcing it from specific technical disciplines makes it hard, however, to identify separate projects in appropriate technology. The study A.I.D. commissioned on the subject demonstrated the importance of appropriate technology, but could not provide any viable ideas for specific regional cooperation in the field itself. Cooperation in appropriate technology rather will take place in individual fields such as agriculture, solar energy, water management, housing, industry, and many other areas, as the parties work together to resolve specific problems. Applying appropriate technology to these and other fields should be strongly encouraged.

Another factor in considering appropriate technology cooperation is the obvious cultural, economic, and other differences between Arab and Israeli societies. The differences in factor proportions and general technical sophistication, for example, suggest that what is appropriate for one country may not be for the other. The countries do, however, share a common environment, climate, and other conditions in which the experience of one can be useful to

the other. Israel has relatively recently graduated from being a developing country. Some of its education and training and technical methods could be more appropriate to Egypt than the American model. Egypt also may have methods for dealing with common problems which can be of use to Israel. Appropriate technology should therefore, be a key part of all Israel-Arab exchanges, but, at this stage, should not be isolated as a discrete sphere of activity.

Housing construction is an example of an area where appropriate technologies particularly adapted to the Middle East have been developed by a number of the countries. Cooperation in research on the building of arid-land settlements having appropriate arid-adapted designs with low-cost indigenous materials could be attractive to several countries in the region. Israel, Egypt and Jordan are each conducting research in this area which could be of considerable interest to the other countries. They all face a housing shortage and a need for low-cost housing adapted to the physical conditions of the region.

Israel has devoted much effort toward establishing settlements in arid regions and this may accelerate as development of the Negev proceeds. Ben Gurion University in the Negev and Technion have conducted research on arid land settlements and some Israelis have expressed interest in collaborating with Arab researchers on the development of appropriate desert architecture and the use of locally available materials.

Egypt is creating settlements away from the Nile Valley and has similar needs in developing housing adapted to this kind of environment. The Desert Demonstration and Training Program sponsored by the American University of Cairo, for example, plans to conduct research on the design of habitats for hot, arid environments and on raw material resources in order to judge the suitability of indigenous materials for construction.

In Jordan, the Royal Scientific Society is doing work on low-cost, desert-appropriate technology, particularly the use of locally available materials and the development of inexpensive construction techniques.

This area would appear to have excellent potential for collaborative research, utilizing any of the mechanisms of S/T cooperation. All the parties appear to be able to contribute substantively to the research. Initial information exchanges on current and planned research would be useful and the subject would be a natural for an early conference or meeting. It also could be an important research

topic for an institute on arid-land development. Research on the availability and use of indigenous materials, however, will be somewhat site-specific and not as amenable to a regional approach.

3) Physical Sciences

The physical sciences--aeronautics; chemistry; electronics and electrical engineering; materials sciences; mathematics; mechanical, industrial and civil engineering; physics; space technology; etc. -- may offer significant potential for cooperation. Both Israel and Egypt give considerable emphasis to work in these sciences and they are the basis for developing modern infrastructures and industry.

The emphasis in physical and engineering sciences will probably be somewhat different than in other areas discussed, since few problems in these sciences will be specific to the Middle East region. There probably would be considerable programmatic emphasis on training of professional and technical personnel, as well as attention to adaptive and developmental engineering to tailor engineering processes and equipment to Middle Eastern needs and conditions.

There probably would be considerable programmatic emphasis on training of professional and technical personnel, as well as attention to adaptive and developmental engineering to tailor engineering processes and equipment to Middle Eastern needs and conditions.

Industrial development involves significant expansion of the cadre of engineering, technical and managerial personnel, as well as development of a special technological base that stressed technologies simultaneously more labor-intensive than the European and more capital-intensive than those appropriate to the least-developed countries. This development pattern offers considerable rewards for regional cooperation in the physical and engineering sciences.

Some aspects of cooperation in these sciences may be particularly sensitive, because of possible military implications or implications of potential competition for international trade. In even the most favorable of cases, caution is advised, stressing a slow process based on interest and perceived needs of the Israeli and Arab engineers and scientists involved. However, the mechanisms of S/T cooperation previously discussed also would be applicable to developing cooperation in the physical and engineering sciences.

This aspect of S/T cooperation, i.e., S/T along discipline rather than project oriented lines, could include national programs having a regional impact as well as regional programs. This could be important because regional cooperation may be difficult in many cases until national capacities are improved.

4) Alternative Sources of Energy

There is some potential for S/T cooperation in biomass, wind, geothermal and other alternative energy sources. There is a possibility of geothermal energy resources in the Rift Valley and regional cooperation in research and investigation is needed as the geological structures cross national boundaries. Cooperation in developing a regional environmental data base could also be useful. Solar energy is discussed in the energy section.

5) Manpower Planning

The countries participating in a peace settlement face labor and manpower problems that will be serious constraints to economic and social development, as well as to internal stability. Among the major problems will be acute shortages of workers, and underutilization of available manpower. Unemployment, spiraling living costs and/or inadequate work conditions also could cause difficulties. There may be some scope for regional cooperation in alleviating these problems. Several specific areas for cooperation in exchanges of information, staff development, research and coordinated manpower programs have been identified in a study conducted by the International Labor Affairs Bureau, Department of Labor.

The Department of Labor study suggested that attention be given to the following program areas which involve serious barriers to economic growth and social development in which cooperation could be useful:

1) Skill Development and Retraining of Workers.
Egypt's economic development is hampered by shortages in industrial, construction and middle management skills, and training institutions in these fields are limited and antiquated. Egypt might benefit from experience and methods of Israel in improving its training facilities and in adapting training curricula to labor market needs. Israel may be interested in improvement of its training programs, particularly those for low-skill persons. The West Bank/Gaza

will be short of managerial, professional, technical and skilled workers and will need to expand and upgrade its training facilities. Jordan, Syria, and Lebanon also have need of workers' training. A regional approach to such problems could be valuable. The countries could consult together about exchanges of skilled personnel and joint use of training facilities, as well as recruitment of workers across national boundaries.

2) Demobilization and Relocation of Workers, Including Veterans and Palestinians. Demobilization, while gradual, will generate a need for special services for counseling, retraining and employment of veterans. Relocation services including job placement and training also may be needed for Palestinians returning to West Bank/Gaza and to other countries. Such activities could usefully involve some regional coordination. Regional cooperation also could be valuable in providing services for other trans-border migrants in the region.

3) Improvement in Worker Utilization and Productivity. There is a pressing need in all the countries to utilize workers more effectively, for two reasons:

- (a) Because of scarcity of well-qualified professional, technical, managerial and skilled workers, it is necessary to utilize them at full capacity in activities important to development; and
- (b) Idle or underutilized manpower of any type is a drag on growth as well as a major cause of poverty.

These problems might be studied on a regional basis. Egypt, Israel, Jordan and Lebanon have management/productivity development institutions, and it could be useful to cooperate in some of the activities of these institutions.

4) Improving Work Conditions and Earnings. Work conditions and earnings have important impacts on labor productivity and economic growth, and on stability in view of workers' rising expectations. Joint regional studies could prove useful as a basis for formulation of public policies and programs in these fields. Such studies could be carried out cooperatively by Egypt and Israel under sponsorship of their ministries of labor or universities, with assistance of appropriate U.S. institutions.

Regional cooperation in these program areas would primarily center among government agencies with labor/manpower responsibilities in the respective countries. Initial activities could take the form of training seminars or informal meetings to exchange technical information and experiences. Meetings might be held in the U.S., subsequently encouraging the other parties to initiate continuing activities, such as clearing houses for the continuing exchange of information, and staff training, in respective subject areas, at Middle East locations. Eventually, formal multilateral arrangements and/or institutions for more extensive cooperation could be created as desired and feasible.

Non-governmental organizations and institutions also could play a significant role in regional cooperation in labor/manpower fields. Cooperative activities among the national trade union centers would provide particularly effective demonstration of working population support for the peace settlement. In this regard, the AFL/CIO has been quietly promoting a triangular dialogue with Israeli and Egyptian labor leaders. Universities, professional associations and employers groups also could make valuable contributions to overall regional cooperation.

6) U.N. Conference on Science and Technology for Development.

A number of proposals have been advanced regarding specific initiatives which could be announced or discussed as part of U.S. participation in the 1979 Conference. Many of these would be applicable to fostering regional cooperation in various areas of research and development described elsewhere in this report.

For example, the National Research Council has recommended in its report, U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference, new initiatives in U.S. scientific and technological contributions to development in such fields as reducing post-harvest food losses, improving soil and water management, pure water and waste treatment, controlling infectious diseases, improving urban settlements, building capabilities for creating and using industrial technology, development and use of energy, remote sensing and other application of satellite technology, and research on the marine environment.

In addition, there are a number of important projects which A.I.D. is planning to start, or to expand significantly in FY 1980 in the Middle East, mainly in Egypt, which might provide some basis for mutual interest in sharing information,

exchanging visits, or other forms of cooperation benefiting regional understanding and progress toward peaceful and friendly relations. Some A.I.D. projects identified as possible initiatives which could be announced or discussed as part of U.S. participation in the Conference are: in Egypt, Applied Science and Technology Research, Aquaculture Development, Educational Linkages, Agriculture Mechanization; and in Syria, Agricultural Research, Agricultural Planning, and Health Centers.

Although the Conference may not be structured to discuss recommendations specific to the problems of a single region, regional projects could be cited to illustrate U.S. support for one of six major themes of the Conference: promoting cooperation among developing countries. At this stage, the details of U.S. participation in the Conference have not been decided, but opportunities for advancing regional cooperation in the Middle East through science and technology for development will be fully considered in connection with final U.S. preparations.

CHAPTER IV TRANSPORTATION

Summary

Based on a survey of transportation in the Middle East done for A.I.D. by the Department of Transportation, detailed feasibility studies of transportation facilities which would link national systems to regionalize these systems in order to promote trade, commerce and tourism may be warranted. Specific links to be studied would include: a new or upgraded trans-Sinai road from Suez to Eilat; North Sinai road and rail links from Egypt to Israel via the northern Sinai and through the Gaza Strip; the short Eilat-Aqaba road to link Jordan and Israel and a widened, improved road plus rail link from Jerusalem to Amman via the West Bank. In addition, the construction of a rail line from the Dead Sea to Aqaba/Eilat to haul Jordanian and Israeli potash may be worth investigation.

Background

Prior to the establishment of Israel in 1948, the region was linked together by a road and rail system adequate for the needs of that time. Remnants of the early system remain but, over the past 30 years economic growth, trade patterns and transportation investments have been based on the actual political realities of the region. In most cases, transport infrastructure has followed the logic of geography and would probably not have been much different than it is today. However, the political isolation of Israel has caused some distortions in the system.

In Egypt about 80 percent of total freight moves by road over an extensive system connecting major urban centers, ports and important locations along the Canal. Egypt also has a rail system which essentially parallels the Nile. It is in poor condition and is losing business to trucks and to a growing inland water transport system which moves along the Nile. Most of Egypt's exports and imports move through the Port of Alexandria, which is heavily congested and is being improved with U.S. help. Port Said and Suez also are important ports. A small port at Mars Matruh on the Mediterranean near the Western Desert is being built and a new port is planned at Safarga on the Gulf of Suez near the Eastern Desert. The Suez Canal, of course, is a major element in world trade. Geographically, Egyptian development centers on the Canal and the Nile with urban centers, population, industry and agriculture concentrated along these north/south axes.

This gives the transport system a north/south orientation with major outlets to world markets both on the Mediterranean and the Red Sea.

Israel's transportation infrastructure has received high levels of investment since 1970 and as a result is well developed. The road network is very dense and the vehicle fleet large. Rail lines link Tel Aviv to Haifa and Jerusalem and the Negev phosphate deposits to the Port of Ashdod. Like Egypt, Israel has ports on both the Red Sea (Eilat) and the Mediterranean (Haifa and Ashdod).

In the Sinai a coastal road of unknown quality runs along the northern coast on the road bed of an old dismantled narrow guage railroad. Military roads run through this area as well as along the perimeter of the Sinai and through the center of the area over the Mitla Pass. These roads are paved but apparently in many areas are not suitable for commercial traffic because they are too narrow, have no shoulders or have curves or gradients that exceed commercial vehicle capabilities.

Roads capable of bearing heavy military traffic with well-distributed weight loads may not be able to handle commercial traffic which has a heavy axleload. Military airports in the region are capable of handling large aircraft, but passenger facilities would need to be built for commercial utilization which could develop as Sinai resources and tourist potential are exploited.

Syria has extensive road and rail systems, though 98% of passenger and 96% of freight traffic move by truck. It has three major ports on the Mediterranean, Tartous, Lattakia and Baniyas, which are, or will be, well connected with the rest of the country via roads. A good road link to Jordan from Damascus is being built since Syrian ports and roads provide Jordan with an outlet to the Mediterranean. Syria also has two international airports.

Jordan's primary mode of transport is highways which connect major population centers adequately. Railroads are used primarily to haul goods to Syrian and Lebanese ports, as well as Jordan's own port, on the Gulf of Aqaba, which gives Jordan an eastward outlet to the sea. Jordan has two major airports at Amman and Aqaba.

Lebanon's transport system has been seriously affected by the prolonged conflict there. Its road network has

deteriorated badly from lack of maintenance as well as the direct effect of the war. Beirut Port has been partially rehabilitated with American assistance and Tripoli apparently is functioning. Prior to the war, the railroads were essentially obsolete and of declining value. Beirut Airport was, of course, a major Middle Eastern air terminus which served as a gateway to the region.

The West Bank was a part of Jordan's transport system, connected to it by several bridges over the Jordan. The West Bank now also has been connected to Israel by good roads. A good two-lane paved road runs from Tel Aviv through Jerusalem and on to Amman. Khan Yunis and Gaza in the Gaza Strip are connected to the Israeli Road system via Ber Sheba and also by a new road along the coast to Tel Aviv. We presume the military roads running out into the Sinai along the north coast go through Gaza.

Findings

It will take time after peace returns for significant changes to occur in the region. Clearly trade and commerce will grow, but slowly. Over time regional activities will begin to knit the countries of the area together. The economic benefits of certain regional transport projects may be slow in coming and may be difficult to quantify.

The most immediate beneficiaries of the regionalization of the Middle East's transportation network would be Egypt and Jordan. Egypt would gain land access to the rest of the Middle East and Europe through the Sinai and Israel, permitting trucking of goods to other Middle Eastern countries that are now airfreighted. Jordan would gain by obtaining direct access to the Mediterranean through Israel and/or Gaza, a much shorter route than is now available through Syria by road or through Aqaba and the Suez Canal by sea. Over the long run all countries would, of course, benefit since distortions in the transportation system caused by the isolation of Israel would be removed, permitting more rational transport planning and investments to meet the demand for transportation services and stimulating intraregional trade.

Specifically, the first steps in regionalizing the transport networks would involve connecting Egypt and Israel through the Sinai and reopening existing links between Israel and Jordan. Road links would be easiest

to accomplish and are more likely to be economically sound than rail projects, though these should not be excluded from consideration. Upgrading to civilian standards the existing military roads between Suez and Eilat and El Qantara at the northwestern end of the Canal and Khan Yunis in the Gaza Strip would provide the necessary links between Israel and Egypt and include the Gaza Strip in the regional network.

Additionally, a railroad link could be considered along the north coast of the Sinai parallel to the road. This would, like the roads, tie Egypt's rail system to Israel's and through Israel to the rest of the Middle East and Europe. The rail link also would provide service for Gaza in either direction. These rail links are not likely to be economically viable unless the Sinai is developed and the Israel-Jordan transport links discussed below which tie Egypt to the rest of the world are completed. Only with Sinai development and the possibility of shipping goods by rail through Israel to the rest of the Middle East and onward to Europe are levels of demand for rail service likely to be sufficient to justify the large capital investment required for a new rail line through the Sinai.

When it becomes politically possible, the first and highest priority transport link between Israel and Jordan could be a short, four-lane road connecting Aqaba and Eilat. These are two major termini of each country's transport system. Additionally, traffic of all types on the East-West corridor from Egypt through the Gaza strip and Tel Aviv/Haifa to Jerusalem and onward through the West Bank to Amman can be expected to increase substantially. This will require the upgrading of the Jerusalem-Amman road and possibly necessitate construction of a railway. There already is a good road from Khan Yunis to Tel Aviv and Tel Aviv to Jerusalem.

We cannot determine at this time whether special transportation facilities in the West Bank and Gaza will be required. A direct transport link between the West Bank and Gaza may be needed. However, from the strictly technical and economic point of view the linkages discussed above appear to be the most rational way of assuring that these two areas are adequately served regardless of the direction trade and passengers move. Though not the most direct route, the road link via Tel Aviv could serve since the distances are not great. The internal transport needs of the two areas have not been studied for this report.

Projects which could be constructed and operated by several countries for their mutual benefit are few, given the nature of the geography of the region and the economies of the various countries. Some may appear in time and with further study. The only such project contained in the attached table of possible regional transport projects is a joint Jordanian-Israeli railroad to haul potash from the Dead Sea to Aqaba/Eilat. Both Jordan and Israel now use trucks. Neither produces sufficient quantities to justify a railroad. With the construction of Jordan's Arab potash plant, the joint railroad might be viable.

There are many projects which are essentially national but could be viewed in part as regional because they must be constructed with sufficient capacity to handle regionally generated traffic, as well as domestic traffic. The additional cost incurred by a specific country because the facility it is constructing must be able to handle regional traffic could be attributed to regional funding. The attached table does not include such projects since it is all but impossible to quantify regionally generated demand on national facilities at this time. Analysis of individual country systems reveals planned levels of investment to meet domestic needs which when completed probably will have excess capacity for at least some period of time and thus be able to handle regional traffic as it grows.

Several transportation activities which do not involve construction appear to be worthy of attention. Technical cooperation is essential if goods and passengers are to move with a minimum to bottlenecks from one country to another in a regional transportation network. To begin with, such cooperation could involve the exchange of information regarding traffic rules and regulations, customs procedures, immigration procedures, etc. As traffic expands, cooperation would have to expand in each mode of transportation. Standardization of laws involving, for example, weight limitation on trucks would be desirable. Eventually, the countries of the region might wish to work together to standardize transport equipment and construction. This would involve cooperative research.

We envision ad hoc cooperation among the government organizations responsible for overall transport planning, regulation of various transport modes and the operation of specific transport facilities. The early formation of a regional transport institute that would provide research facilities, training, and a forum for working out mutual

important research activities which could receive early attention might be arid land road construction research. This would focus on road construction problems peculiar to the climate and the geography of the area and in particular could provide a focus for investigating critical matters, such as the environmental impact of roads on the desert ecology.

Though no projects are included in the field of aviation, this clearly is an area that will require extensive cooperation and coordination. It is possible that some sharing of training and maintenance facilities will arise out of the more limited initial cooperation. More likely though, each country will deal with its airports, airlines, air traffic control and regulation on a national basis taking into account the need to standardize and cooperate regionally and internationally. The current situation in the Middle East is chaotic, with very limited cooperation between Arab states. There are two organizations, the Arab Air Carrier Organization and the Aviation Council of Arab States, which with the admission of Israel could provide the mechanism for regional cooperation and coordination. Improvement in the various countries needed to enhance safe and efficient operation hopefully will be speeded up by the growth of tourism which will lead to more international flights and international pressures for improvement.

Since each project discussed above links a pair of countries, it is possible to focus on any project or group of projects independent of the other (i.e., give early consideration to Israel-Egypt projects). However, the economic viability of individual projects will be affected by the political context in which they are viewed, in that the projected levels of traffic and therefore benefits will be lower if a project links two countries rather than functions as part of a total regional network. To some extent, uncertainties in this area can be dealt with by phased construction as in the case of a road which can be built two lanes wide and later upgraded to four. This is not possible with rail lines which require a minimum level of traffic over certain distances to be viable. Alternative approaches or deferral of the specific project might be required in these cases. Such factors, which influence economic viability, should be an integral part of the feasibility studies which would have to be done for each project. The studies would indicate the value of the project in a bilateral context as well as a regional context.

Regional Transportation Projects Identified for Further Study:

Title 1/	Brief Description	Potential Benefits	(Millions) Estimated Cost	Approximate Time Frame 2/
Detailed Prefeasibility Study	To look more closely at the projects listed below and determine more accurately whether they should be studied in detail		\$0.25	3-6 months
1. Trans-Sinai Road	Improve to civilian standards 250 km. road from Suez to Eilat thru Mitla Pass	Link Egypt and Israel and Egypt thru Israel to Jordan and Syria; promote development of Sinai including exploitation of minerals	\$54.0	4-6 years
2. North Sinai Rail Link	Construction of standard guage 130 km. railroad between El Qantara on the Suez Canal and Khan Yunis in the Gaza strip thereby linking Israeli and Egyptian rail systems	Link Egyptian rail system to Israel and thru Israel to rest of Arab world and Europe; promote tourism; stimulate minerals exploitation in the Sinai	\$159.0	6 years
3. North Sinai Road	Improve to Civilian standards 200 km. road from El Qantara to Khan Yunis	Link Egypt to Gaza and Israel; promote tourism and trade	\$39.0	4-6 years
4. Eilat - Aqaba Link	Construction of 8 km. four-line expressway linking two cities	Link Israel and Jordan; major tourist route; permit movement of goods between two ports; complete linking of Egypt to Saudi Arabia and Europe	\$9.0	2 years

Title ^{1/}	Brief Description	Potential Benefits	(Millions) Estimated Cost	Approximate Time Frame ^{2/}
5. Jerusalem - Amman Railroad	Construction of Standard gauge 72 km. railroad through the West Bank to link Israel, the West Bank and Jordan	Link Israeli and Jordan via West Bank; link West Bank and Gaza; complete rail linking of Egypt to other Arab states and Europe; major tourist potential	\$21.0	6 years
6. Jerusalem - Amman Highway	Highway improvement widening to four lanes and improving existing road	Link Israel and Jordan; handle expected increase in flow of goods and people; provide access by road to Arabian Peninsula for Israeli and West Bank goods	\$15.0	4-6 years
7. Dead Sea to Gulf of Aqaba Railroad	A Joint Israeli - Jordanian Railroad of 165 km. to carry potash	To be economic about 3 million tons of freight are needed which neither country can generate but which might be achieved jointly	\$41.0	6 years

^{1/} Numbers keyed to map.

^{2/} From decision to proceed with feasibility study to completion of construction.

Chapter V. TELECOMMUNICATIONS

Summary

The Arab countries of the Middle East are linked together in an adequate telecommunications network which will be expanded significantly in the next several years if planned investments are carried out. Israel also has good external links but, of course, none with its Arab neighbors. While satellite communications can provide interconnections on a temporary basis, peace between Israel and one or more of its neighbors will require the construction of telecommunication links which can serve an expanded demand economically.

The specific links discussed herein are predicated on the assumption that they all will be implemented at some point in time to create a regional network. While some parts could be done earlier and some later, they represent, in toto, a system which would provide direct or indirect connections for all countries of the region. This section is based on a report done by Teleconsult, a consulting firm under contract to A.I.D.

Background

Peace in the Middle East will result in an immediate need for permanent, economical telecommunications facilities between countries. While it is difficult to predict the growth of regional demand, it is interesting to note that, historically, projections and the systems on which they were based always have underestimated required capacity. As with the regionalization of the transport network, demand for service will not appear until the service is available. Once it is available it will stimulate trade and commerce, cultural interchange, tourism and other economic and social linkages which in turn will further increase demand for telecommunication service. Experience elsewhere demonstrates that trade revenues are linked to international telephone calls with good international service generating revenues and revenues increasing the number of calls. People must be able to communicate with each other in order to do business.

Unlike transportation, telecommunication linkages can be obtained in many ways and by varying routes at different levels of cost. All of the Arab countries of the Middle East are linked together by various modes of communications. Hence the study undertaken by the contractor focussed on integrating Israel into the network, and improving overall regional communication facilities capable of handling growing regional traffic using less expensive, more dependable facilities between Arab countries. All types of communication services applicable to commercial use -- satellite earth stations as well as other types of systems -- were considered. Those types not included in the report were omitted because they were unsuitable. Because of special interest in satellite communications, the reasons for its unsuitability in a regional system are set forth below.

The use of satellites was investigated and found to represent only a temporary expedient, because satellites for regional communications involving short distances are not economically usable. The cost per unit of service is high and does not vary with distance. Hence, satellites are better suited for long distances. Within a compact region such as the Middle East, communication can be handled at much lower costs and with greater flexibility by coaxial cable, microwave, and radio relay systems. Comparisons done by the A.I.D. consultant indicate regional satellite communications would cost about 7 times more than microwave radio relay.

The countries of the Middle East, excluding Israel, are linked together and with the rest of the world with adequate communication links. Internally, their systems vary from very poor to good. All of the countries are upgrading their systems and expanding capability. Israel has a good internal communications system and is connected to the rest of the world by various means. However, Israel is totally cut off from the Arab world in general and its neighbors specifically, except for the most roundabout routings (e.g., through Europe).

Regionally and internationally, Egypt is connected to Lebanon by an undersea coaxial cable and to Italy in the same manner. There are plans for an undersea link to Saudi Arabia across the Red Sea. Israel has two undersea

cables to Italy and France. Jordan is connected to Beirut by radio relay (currently out of service) and to Damascus by coaxial cable. The latter is in poor condition and will be abandoned when a radio relay is completed. Damascus is linked to Beirut by a high capacity coaxial cable and radio relay. It has several links to Iraq. Beirut has undersea cable links to Alexandria, France, Cyprus and a radio relay to Cyprus. Saudi Arabia has a substantial internal system with major expansion plans under implementation. It is not well connected with its neighbors. The Gaza area appears to be tied to the Israeli system by a high capacity radio relay through Ber Sheba. The West Bank has local telephone service based in Jerusalem which presumably connects the West Bank to Israel. Little information on the West Bank and Gaza was available to the contractor.

Findings

To create a regional network integrating Israel and providing better connections between the Arab states, seven specific telecommunication links were identified by the contractor, which would appear to provide good economical service. These seven are divided into an initial three which would link the countries of the region directly or indirectly, and a later four projects which would improve the regional system by providing complete direct connections as well as alternates. These seven projects are listed in the attached table, which also shows roughly estimated costs of construction and the annual cost of maintenance and operation of each project.

The seven projects would cost in the order of \$40 million. At least one half of this amount would be required initially for the first three projects with the remaining half to be provided over a 2-3 year period. The initial investment would include construction, the cost of all equipment, installation, and management and training for the complete program, to include coordination with the host administration. The estimates are adjusted for inflation and include cost factors for risk and unforeseen problems. Initially, funds also might have to be provided as shown in the table for the costs of maintenance and operation of the system; however, it would be likely that these costs would later be offset by revenues generated by the system.

The projects almost certainly could be expected to provide substantial benefits in terms of economic, commercial and cultural linkages among the residents of the region. Egypt, Israel, Syria and Saudi Arabia all face a large unsatisfied demand for domestic telephone and telex services, and each country has active plans to expand and improve their national networks. As local service is improved in each of these countries, the demand for international service can be expected to keep pace, creating a natural need for telecommunication projects. Therefore, a program to facilitate and expedite the early construction of a regional system would strongly encourage the use of each country's telephone/telex facilities to seek economic, commercial and cultural ties with its neighbors.

The telecommunication needs of the Sinai, the connection of Israel and Egypt and perhaps Egypt and Gaza must be dealt with together. The top priority link identified by the contractor is a coaxial cable or radio relay link from Ismailia to Ber Sheba. Giving the regional connection priority, the coaxial cable along this route appears to be best. However, a radio relay may better serve the Sinai since it is easier to provide local service with radio relays than buried coaxial cables. Additionally, it might be better to follow a route to the north of the Mitla Pass closer to the coast, since that is an area with developmental potential. Finally, we assume that the Ismailia-Ber Sheba link would provide Egypt with communications to Gaza since Israel has a radio relay from Ber Sheba to the Gaza area. If this were not acceptable politically, an alternate plan would have to be developed. A side benefit of an Egypt-Israel link would be Egyptian access to Israel's undersea connections to Europe. At a later stage, a radio relay link between Suez and Eilat could be considered. This would provide back-up to the Ismailia-Ber Sheba route and permit Egypt to tie directly into Jordan's system at Aqaba. If the third priority link discussed below were implemented, the line across the Sinai also would give Egypt a connection to Saudi Arabia through Aqaba.

A good connection between Israel and Jordan is equal in priority technically and economically to the Israel-Egypt links discussed above. The timing of such a link is of course dependent on the peace process. Viewed as part of a regional network it is a logical link because it permits a

better connection between Egypt and Jordan and through Jordan to Syria. The short distance involved and the need to provide economic service to the West Bank indicate microwave radio as the best suited approach to joining Jerusalem and Amman. This assumes, of course, that the West Bank will be served by Jerusalem. The final resolution of the political status of the West Bank might require the exploration of further alternatives.

To complete the regional network a radio relay between Jordan at Aqaba and Saudi Arabia at Haql, which will be on the new intra-kingdom microwave net, would provide access for Egypt, Jordan and hopefully Israel to this potentially large market. This of course would link an Arab country to an Arab country and not directly involve Israel. However, from the point of view of creating a meaningful regional system capable of serving business and tourism, this short connection would be essential. With the Egypt-Israel, Israel-Jordan and Jordan-Saudi Arabia links, a complete regional network would then exist.

As noted above, the second tier of projects include another Israel-Egypt tie-in by radio relay between Suez and Eilat. Also included are radio relay links from Damascus and Haifa to the radio relay line now connecting Amman and Beirut. This would give Israel, Syria and Lebanon direct connections and improve Egyptian connections to the two countries. The lowest priority project is a direct connection between Syria and Saudi Arabia. This second group of projects goes beyond connecting the region. It provides direct and alternative indirect connections for all countries, improving service, expanding capacity and enhancing reliability.

Based on the information available, the total program represents an informed technical judgment as to what would make an effective low cost regional communications network. Beyond the purely technical and construction aspects discussed above, there is an urgent need for an organizational framework in which joint planning can be carried out, revenue sharing decisions made, maintenance responsibilities allocated, and other cooperative aspects related to the construction, operation and maintenance of regional telecommunications implemented. Without underlying agreements and cooperation, regional communications cannot be effected.

In addition to cooperation in the planning and construction of regional facilities, the participants in the network must know what demands will be placed on their domestic systems and be willing to make the necessary investment of capital and manpower.

Peace in the Middle East will open the way for major improvements in regional communications as well as permit the integration of Israel into the regional network. A regional communications system holds the possibility of great benefit for all participants. However, it is an area that demands considerable prior agreement and cooperation of all participants if planned investments are to be implemented and properly utilized. In addition, a regional system requires regional planning rather than ad hoc bilateral interconnections in order to obtain maximum benefits for all parties. At a minimum, feasibility studies of bilateral links should include detailed consideration of the impact of the link on the total regional network and the impact of an eventual regional network on the capacity and economics of the bilateral link.

A detailed feasibility study to design one Egypt-Israel link and conduct a more detailed prefeasibility study for a total regional network would permit the immediate construction of the one link that appears to be possible in the reasonably near future, while providing the basis for subsequent regional telecommunications investments. Such a study would require an estimated five to six months to complete and cost approximately \$600,000. As noted in the attached table, the first Egypt-Israel link would cost on the order of \$9.1 million and would take about one year to design and construct if coaxial cable were used. A radio relay link would take a little less time.

POTENTIAL REGIONAL TELECOMMUNICATIONS PROJECTS

<u>Sequence</u>	<u>Route</u>	<u>Type of Facility</u>	<u>Purpose</u>	<u>Initial Cost</u> (Millions of Dollars)	<u>Annual O & M Cost</u>
1. a. .	Ismailya-Ber Sheba	Radio relay or coaxial cable	To link Israel and Egypt; to provide service to the Sinai; to link Egypt and Gaza	0.1	.67
b.	Jerusalem-Amman	Micro-wave	To link Israel and Jordan; to provide service to West Bank; via 1.a, to link Egypt to other Arab countries	6.8	.50
c.	Aqaba, Jordan, Haql, Saudi Arabia	Radio relay	To tie Israel, Egypt, Jordan, and Syria into Saudi Arabian micro-wave system	3.1	.23
				<u>Sub-Total</u>	
2.	Haifa to junction on Amman-Beirut radio route	Radio relay	To provide Israel with direct link to Beirut and with 3, below, to Syria	19.0	1.4
3.	Damascus to junction on Amman- Beirut radio route	Radio relay	To provide Israel and Syria with a direct link	2.4	.13
4.	Suez-Elath/Aqaba	Radio relay	To provide an alternate connection between Egypt and Israel, Egypt and Jordan, and, via 1. c., Saudi Arabia	1.7	.13
5.	Qurayyate, Saudi Arabia-Sweida, Syria	Radio relay	To directly connect Saudi Arabia to Syria on the Damascus-Amman radio relay route	8.3	.61
				7.4	.61
Total					
					<u>2.85</u>

Chapter VI WATER

A) Fresh Water

Water is the key to development in the Middle East; in some cases it is the key to survival. The geographic location of water resources and other factors are such that the sharing of water is at best difficult and costly. In the long run each country must seek to utilize the water available to it in a manner which provides full value for every drop based on its scarcity. Likewise each country should plan its economic development on the basis of the cost and quantities of water it can realistically expect to have each year. Egypt must utilize the Nile water and groundwater resources for irrigation by the most efficient systems and technologies available. Jordan, Israel and the West Bank must recognize that the water resources available to them are extremely limited and of a high value and jointly plan for optimum utilization as well as develop national plans which view water availability realistically. This may well mean limiting agricultural production.

The Sinai and Gaza represent special problems in that neither appears to have much water. Some of the water in the Gaza Strip may well come from aquifers shared with Israel in which case some form of cooperation will be necessary. In the Sinai there are pockets of groundwater but these are not likely to provide long term water sources. Israel undoubtedly has investigated both areas and has data which would be useful. It therefore, would be beneficial if Israel and Egypt could cooperate at least in the Gaza Strip and exchange information about the Sinai. Should Egypt and Israel both be interested at least a prefeasibility level study might be done to consider the possibility of the sale of Nile water to Israelis.

Background

For the purposes of this section, water refers to fresh water suitable for drinking, industrial uses and agriculture. The sources of water are surface water (water contained in rivers and streams), ground water (water trapped in geologic strata beneath the surface of the earth) and technologically produced water (desalted water, recycled waste water, etc.). The quantity, quality and location of surface and ground

water is determined by various natural conditions, primarily rainfall and geology. It is possible to do many things with surface and ground water. It can be moved from place to place; it can be conserved by various means; its quality can be improved. But the fact remains that the total quantity of naturally occurring fresh water available for use in any given time period is determined by natural conditions and events which cannot be modified.

Water is both a necessity of life and a raw material for production. As a necessity of life the price of water is secondary to survival. As a raw material, it must be viewed as any other raw material with its value set by its scarcity and cost of production and its uses determined by the financial and economic returns it will bring in relation to its financial and economic cost.

The Middle East is divided into several distinct watershed areas or zones which are not closely related to political boundaries. To the southwest the Nile River, a major river with its headwaters near the equator in eastern Africa, flows north to become the heart and soul of Egypt. It affects only Egypt and the countries upstream. To the northeast is the Euphrates River, another major river which heads in Turkey and flows south and east through Syria into Iraq where it joins the Tigris River in the historical Mesopotamian Valley. In the center of the region is the historically and economically important Jordan River Basin, much of which is below sea level in the Rift Valley. This Jordan River is a very small stream that heads in Lebanon and Syria and flows south to the Dead Sea. Its natural basin involves parts of Lebanon, Syria, Israel, Jordan and the "West Bank" area. To the north, also in the Rift, is the Litani River which lies entirely within Lebanon and exits to the Mediterranean Sea. Along the coast many small streams flow from the hills and mountains directly into the sea. In southern Israel, Gaza, the Sinai, and Egypt, such streams seldom have water except during rare flash floods. The rest of the area is desert, which has at best only limited supplies of groundwater.

Groundwater resources have been studied to some extent in Israel and Jordan, including the "West Bank area", but the potentials are not sufficiently well known. Further studies on the East and West Banks are planned with A.I.D. financing. In the other areas of the region, groundwater studies have been localized and are generally incomplete. From the topography, geology and rainfall, speculation is possible as to potential locations and problems of groundwater development. In some of the desert areas of the

Middle East (e.g., the Sinai and Gaza) there might be groundwater. However, projects based on these sources will be relatively expensive as many wells will be unsuccessful due to salinity or the inherent difficulty of locating wells in some limestone formations. In most desert locations use of such water sources must be recognized as "groundwater mining, with clearly limited supplies because the rainfall is so low as to provide little or no recharge. Careful study to locate groundwater sources in the desert and determine how best to use such water is clearly needed.

Rainfall in the Middle East varies from almost none in desert areas to over 60 inches (1500 millimeters) per year on Mt. Hermon. It also is highly seasonal, almost all being during the winter when the winds are from the west and bring moisture from the Mediterranean Sea. As the winds strike the hills and mountains, precipitation occurs on the upslopes and for a very short distance beyond the crest. The height and gradient of the uplift controls the amount of precipitation. Thus rainfall tends to be in bands along the coast and coastal hills and along the foothills of the Great Rift east of the Jordan River.

Due to the irregular geographic and seasonal distribution of rainfall, water is a critical need in the Middle East from the Sinai to Jordan and, unfortunately, is badly limited in amount and locality. Except for distant rivers such as the Nile and the Euphrates, the so-called "rivers" in this area would generally be called streams in the United States. This relative scale is important to an adequate comprehension of the problems involved.

At present much of the water used in the Middle East is for agriculture. However, municipal and industrial needs are growing rapidly. The heavy demand and small supply require that every potential source be developed to its maximum potential and that all water be economically used and equitably distributed. The usual economics of water resources development become somewhat distorted by the benefits of survival. For many people in many localities there is no alternative means of livelihood other than agriculture which generally must be irrigated. Low incomes dictate low prices locally and low farm prices mitigate against the costly modern works required to provide the needed water. For this reason it is essential that new irrigation projects be accompanied by agricultural programs to increase the effectiveness and efficiency of the farmers. It also is essential that new projects be designed for modern efficient

water use techniques and that the older irrigation systems be redeveloped and modernized. In the long run the water short economies of Israel, Jordan and the West Bank will have to provide alternative sources of employment and limit agricultural development as population growth increases the demand for water for survival and water gets sufficiently scarce to make it economically suitable for industrial use.

From a standpoint of scale and major increases in agricultural production, the Nile River has great potential. Egypt has made much progress but has far to go before its potential water supplies are fully and efficiently used and the many associated problems are adequately solved. The Euphrates River basin in Syria also offers a major potential for irrigated agriculture. Both countries have plans to fully utilize their water resources through construction of major irrigation and drainage facilities and both are receiving economic assistance in this area from the U.S., the World Bank and other donors. Progress is slow, however, and full utilization of water will not occur for some time. A major water balance study being conducted for Egypt by the World Bank will be of great importance in future planning.

Findings

It is difficult to see areas of potential cooperation between Israel and Egypt in the water sector, except possibly the sale of Nile water to Israel, if reported statements by President Sadat are correct. Egypt has plans for the full utilization of the Nile in the future, and any selling of its water to Israel would be for a limited time period. It currently plans to treat the Sinai as an integral part of Egypt and is not favorable to regional projects there. At best Israel might be able to assist the Government of Egypt in search for ground water in the Sinai since Israel is more technologically advanced in this area and probably has done some work during the occupation period. Also, Israel might provide information and assistance in irrigation systems which conserve water. It should, however, be noted that the technologies which Israel has are available elsewhere in the world. The only really unique commodity Israel may have to offer is directly applicable experience. The same applies to the Gaza strip.

It will be some years before Egypt fully utilizes the full flow of the Nile. Additionally, current irrigation systems do not conserve and optimize the use of Nile water.

No one can even guess at how long the surplus of Nile water will last. However, a detailed review of Egyptian plans, including the World Bank Water Balance study plus saved water from the introduction of better irrigation and drainage techniques, might reveal a surplus of water available for a sufficiently long time to make it economically feasible to consider a water transmission line to Israel which also would serve Gaza and the Sinai. Rough cost estimates indicate that the capital investment required to deliver Nile water to northern Sinai and the Gaza area by pipeline would be between \$360 and \$615 million dollars. Associated land development to permit irrigated agriculture in the Sinai would add perhaps another \$360 million. Factoring in operations and maintenance cost, the total undiscounted cost of a Nile pipeline could be as high as \$1 billion and probably no less than \$750 million. To achieve benefits equal to or better than the projected cost of the project would take a long time and the production of very high value crops and industrial products. Still, the value of water is so high in water-short Israel and water is needed so badly to permit any kind of economic development in the Sinai and Gaza that the project is worth looking into further. A pre-feasibility study could be undertaken if both parties so desire.

There is one important point, however, which must be considered. The transmission of Nile water, if it should prove economically feasible, is only a temporary palliative. Sooner or later Egypt will require the water for its own use and sooner or later Israel will have to live with the water it has available unless dramatic and unexpected breakthroughs are made in desalination. This being the case, if Israel gets Nile water it still must begin planning for the future as it will exist and not defer the inevitable hard choices it must make.

With or without the provision of Nile Water, Israel, Syria, Jordan and the West Bank must cooperate to conserve the surface and ground water resources of the Jordan Valley. Although some of the headwaters of the Jordan spring in Lebanon, its importance in the watershed of the Jordan is minimal. The division of the waters of the Jordan River between all the riparian states and the West Bank is still without a legal framework, despite the prolonged efforts of the U.S. in the mid-fifties to assist in the conclusion of a comprehensive agreement. The riparians have, to some extent, observed the spirit of the partially negotiated but incomplete and unsigned agreement that resulted from the

Most past studies of water requirements in the Jordan River Basin concentrated on water requirements for agricultural uses, paying little or no attention to municipal and industrial demand. During the last several years, however, the shortage of drinking water, particularly in the urban population centers, has loomed ever larger as a critical problem that must be solved, taking into account the now obvious fact that water resources are limited, even with full development of surface and groundwater availabilities. This is true both in Jordan and Israel. (There are no large urban centers in Syria or Lebanon within the boundaries of the Jordan River Basin.) It will be impossible, both for social and domestic political reasons, to ignore the urban water supply problem. Jordan has begun to study the problem and will, in the near future, face critical decisions on the apportionment of available water to municipal industrial, and agricultural uses. We believe that Israel may have recognized the problem earlier but we have no detailed information on the steps it has taken or plans to take. We do believe Israel has taken steps to ensure maximum utilization of its water resources.

The water requirements of both Israel and Jordan are so large, and the water availabilities so limited, that attention should be focused on the need to establish a long-term water policy on the national and binational levels. Such policies would permit a rational allocation of water for different kinds of use within each country and regionally.

It thus would be possible to define the limits of agricultural development possible with the available water and to define the framework for economic planning on a national and regional level and to define the direction which economic development should take. Unless unforeseeable new water resources are discovered, it is very likely that not all potentially arable land can be developed and that other economic activities will have to be substituted to permit economic development to continue.

In this situation, the exchange of information between the two countries and, to the extent this would be useful, joint planning based on a coordinated water policy, would be highly desirable.

After the Magarin Dam is built on the Syria-Jordan border, as now planned by the Jordanian Government with U.S. and other donor assistance, the last remaining major

source of surface water (the Yarmouk River) will have been controlled. The planned diversion of Wadi Raqqad into the Maqarin Dam reservoir will leave only minor flows remaining from Wadi Raqqad and other side wadis below the dam during the winter months and their economic use would be limited. Furthermore the planned diversion of Wadi Raqqad into Maqarin makes such projects as the storage of water in Lake Tiberias or a second, lower dam on the Yarmouk unnecessary.

The West Bank is now relying on groundwater and minor surface flows for both agricultural and municipal purposes. The availability of groundwater in the future is governed to a large extent by the capacity of the aquifers which the West Bank shares with Israel since excessive pumping results in salt water intrusion and pollution of aquifers. Additional intensive groundwater investigations are needed to establish the extent of long-term availabilities for the West Bank. There also is a need to study how surface water would be conveyed to the West Bank from such sources as the Yarmouk River or Lake Tiberias. (A study of West Bank water resources is being planned by AID.) Rehabilitation of the irrigation system as it existed in the West Bank prior to Israeli occupation should not be undertaken without careful study. The original East Bank system was designed and constructed as part of a total system including the West Bank. Development on the East Bank may well have affected the assumptions on which the West Bank system was based. Also, new technologies have been developed and far more is or will soon be known about the water resources of the area. What was once useful may no longer meet contemporary needs or maximize economic benefits.

B) Desalination

Summary

As noted in the previous section, naturally occurring fresh water is very scarce in many parts of the Middle East. With populations growing and urban centers expanding, the demand for water for drinking, sewage, industrial use and agriculture will grow. In addition to maximizing the value obtained from naturally occurring sources and fully exploiting all sources, the countries of the Middle East have demonstrated an interest in desalination technologies as a means of supplementing water resources. The U.S. and Israel have been working together on a 10-million-gallon per day (MGD) prototype project since mid-1975. The project has reached the pre-final design phase and has produced some major engineering

innovations. Recently the Government of Jordan expressed interest in research linking solar generation with brackish water desalination. Several sea water desalting plants for the production of potable water are in operation or under construction in the Gulf States where additional fresh water supplies are required for economic development and where capital and high water costs are not significant limiting factors.

In 1968, the U.S. studied the prospects of a large-scale multipurpose energy, desalination and industrial complex. At that time such a project did not appear to be feasible. With increasing power costs and changes in world market prices, such a project still is of doubtful economic viability but at some point in time it may be desirable to restudy the idea. However, this should have a low priority for immediate attention.

A combination such as solar power and reverse osmosis desalting of brackish water might produce relatively low cost water on a small scale suitable for rural areas. It is even possible that such units might produce water cheaply enough for controlled environment agriculture or for use on salt-resistant crops developed by agriculture research. Small-scale plants using membrane processes and power sources for different applications are not necessarily regional in nature if the participants do not wish to cooperate. However, cooperation in the pooling of past experience, the structuring of future research and development, and the sharing of results would be beneficial insofar as they would reduce the time and expense of such activities.

Background

Numerous studies have been conducted on the production and use of desalted sea water, some of which have been specifically directed to the Middle East. One of these, the Oak Ridge National Laboratory Middle East Study of 1968-72, is quite comprehensive in its analysis of the situation and the role that possibly could be served by desalted sea water. This study analyzed the production and use of desalted sea water and electricity in large amounts from dual-purpose nuclear power plants. The proposed use of the fresh water and electricity was to produce agricultural and industrial products in large and efficient agro-industrial complexes in hope that the economies of scale and effective use of technology would make these plants commercially competitive. Such complexes were found to have many advantages, particularly with respect to their long-term potential. However, the

study concluded that, at that time, a more effective utilization of the limited financial and other resources would be to find ways for utilizing existing fresh water supplies more efficiently and more effectively.

Other studies that have been conducted on the use of desalted seawater for agriculture, even in this region of extreme water shortages, generally come to the same conclusion, namely, that because of high cost, this is not yet an economically viable solution for agricultural, though it might be advantageous for the production of municipal and industrial (M&I) water at selected locations.

The Oak Ridge study estimated the investment for a large multipurpose project at from \$250 million for a fossil fuel plant, to over \$400 million for a nuclear fueled plant. The rate of return proved to be relatively low. The figures used in the study are completely out of date today. The Oak Ridge experts who worked on the original study believe their estimates for the power plants alone are now low by a factor of 2.5 to 3.0. As an example, a figure of \$0.28 per MBTU was used for oil at that time, whereas today it is \$2.40. On the income side, the study assumed that the plants would produce water for irrigation of high value crops, electric power for direct sale and use in a national or regional grid and solar chemicals from the byproduct brine. All of these products are still being produced by less expensive means. Even with changes in world market prices, they are not likely to be produced at competitive prices by such a complex for some time to come, barring a major technological breakthrough. Under these circumstances, the rates of return in the original report are not likely to have improved and may well be even worse, given increased capital and operating costs. The joint U.S.-Israel desalination plant being developed (a 10-million-gallon per day prototype) is important in this context. It is in the pre-final design stage and several major innovations have been achieved. Construction and equipment procurement will begin shortly, with the prototype to be operational in 1981.

Clearly, large scale multipurpose power and desalination plants are of interest to the countries of the Middle East. This is an area to which the U.S. has much to contribute. It also is an area which will require costly research and development and ten to twenty years from studies to commercial operation.

At the present time, the major oil-producing countries of the Middle East - such as Saudi Arabia, Kuwait, Iran, and

plants for potable water at a very rapid rate. In, fact the Middle East is leading the world in the construction and use of sea water desalting capacity. Saudi Arabia alone has a total desalting capacity of more than 23 million gallons per day of fresh water. The product water is used for municipal and industrial purposes serving regions which have no alternative source of fresh water and thus command a much higher price than usually can be afforded for agricultural water.

In contrast to the large sea water desalting plants and multipurpose energy, desalination and industrial complexes discussed above, development of relatively small brackish water desalting plants appear to have potential for a variety of applications. Such plants have great flexibility for being located where there are local needs and where there are local supplies of brackish water which are not limited to the coastal areas. Also, the product water might be less costly than the product water from sea water desalting plants because the lower salt content requires less power. For this purpose membrane desalting technology, rather than a distillation process, appears to be more suitable as it is cheaper, more flexible, and less energy intensive for this class of application. The membrane technologies can be used on a wide range of brackish waters with salt contents as high as those for sea water. However, they lose many of their advantages when applied to high-saline waters, and probably the best* and most likely applications will be for waters having about 10,000 ppm or less of tds. There apparently are many sources of brackish waters within the Middle East region which meet this criterion. There are two membrane technologies in commercial use in the U.S. available for an initial pilot scheme.

Findings

Desalination is a highly complex subject, involving sophisticated technologies. New technologies which permit smaller scale operations with proportionately shorter lead times and smaller investments are available for trial and development pending further technological breakthroughs in large scale desalination plants powered with nuclear or other types of power.

The most promising area for immediate attention is in solar power production and other alternative energy producing possibilities are tied to small-scale brackish water desalting plants using a membrane process. Certainly the indications are positive and make this a worthwhile venture. Several independent projects could be developed, each consisting of a

small (50,000 to 200,000 gpd) membrane desalting plant for treating brackish water. Each of these projects would have multiple objectives to include:

1. Provide training and experience in the construction and operation of brackish water desalination plants.
2. Provide a realistic basis for determining the costs of desalted brackish water for (a) municipal and industrial uses, and (b) agricultural uses.
3. Provide a source of water for a small experimental agricultural farm to determine how such water could be most effectively utilized in a region which has no or limited access to fresh water.

It would be desirable to have several such projects in order to provide experience and cost information under different sets of conditions and involving different combinations of conditions and power sources. Having more than one such project also would provide for competition and give a comparative basis for analyzing the costs and impacts brought about by working under different climatological conditions with different types of soils and brackish waters of different chemical compositions.

If the demonstrations were successful, the transition to larger projects could be rapid and smooth. Since membrane plants can be expanded by adding modules, they are economically less sensitive to sizing than distillation plants and they can be expanded in phases to any size and scope considered desirable for a particular situation. Assuming a power supply of equal flexibility is available, a high degree of flexibility exists for tailoring the plants to special circumstances, and expansions could be made in a smooth and almost continuous manner. Such an evolutionary development could proceed from a small demonstration project to one meeting local needs.

One would start by defining the size and location of the brackish water desalting plant with the other project features sized and planned accordingly. Important variables which must be considered in sizing and locating the water desalting plant are:

1. The need for water and the lack of better alternatives for providing it.

3. The suitability of the selected region for using high cost desalted water effectively, taking into account total needs.
4. Availability of an adequate and reliable source of energy.

Potential for expansion should the results from the demonstration project be favorable.

Pilot plants could be located on the West Bank, which has salty springs; at the southern end of the Rift Valley in Jordan where there is almost no water for irrigation other than the saline Jordan River and saline ground water; in the Northwest Sinai, where there are saline wells; and in the Gaza area, which might have to draw on sea water as well as saline ground water. Pilot desalting plants should definitely be tied to pilot energy projects such as solar generators.

Chapter VII ENERGY

A. Electric Power

Summary

This section focuses on the potential for regional co-operation in the generation and transmission of electric power using conventional fossil fuels, hydro, nuclear energy and other types of energy sources exclusive of solar power, which is treated separately. The section assesses the electric power situation in each country to determine whether there are any apparent advantages to two or more of the countries in sharing power generating sources through the sale of power and/or regionalizing the power transmission systems of the countries of the region.

There appear to be significant benefits to a regionalized transmission network connecting Israel, Jordan, Syria and Lebanon. The cost versus benefits of high voltage interconnector between Israel and Egypt requires careful study. Such a connection by itself might have limited utility since it would benefit Israel and Egypt only when one had a surplus and the other a shortage of power. If the interconnector were related to development of the Sinai, the prospects for an economically viable project would be improved. If Israel and Jordan were linked, the Israel-Egypt link would become more beneficial, since Egypt would then be part of a total regional grid. There is scope for cooperation in seeking and studying other sources of power such as coal and geothermal energy.

Background

Demand for power is increasing rapidly throughout the region. Growth projections indicate an average growth in demand of ten percent per year for the region. It appears that Jordan, Egypt and Israel are all power short though current construction in Israel may change this for a brief period. Syria has a power surplus which is projected to last into the mid-1980's, when rural electrification is expected to increase demand significantly. Half of the installed power generating capacity in Syria and Egypt is hydro-electric from the Euphrates and Aswan Dams. All of Israel's present power is generated by oil-fired plants using mostly imported oil, while new plants will be coalfired (primarily based on coal from South Africa) to

permit diversification of energy sources. Syria will increasingly use hydro-power to meet its domestic needs in lieu of older inefficient oil and gas units though it does have plans for the construction of a major thermal station. Egypt uses oil-fired thermal stations in addition to its hydro and plans to continue building new oil-fired stations to replace old inefficient units. The oil is domestically produced. Use of gas also is planned. Jordan's power generating facilities appear to be the least developed, relying on diesel generators and gas turbines. Steam provides a rather small share at the moment but construction in progress will change this. In 1977 Jordan imported about 2 percent of its power from Syria. Lebanon has oil-fired thermal and hydro-electric power facilities. It is not known whether Lebanese capacity is or was sufficient to meet demands.

In the area of generation, cooperation could center on the sharing of a low-cost source of energy suitable for the production of power which when sold would bring a good return to the owner and when purchased would provide power at reasonable costs. In this category, one first thinks of maximum development of hydro power sources in Syria primarily. In Israel and Jordan the difference in static head between sea level and the Dead Sea might produce cheap power but this would be a complicated, expensive project and would require further careful study. The water might be brought from the Mediterranean or the Gulf of Aqaba. Also in this category would be presently flared natural gas in Egypt which, though limited in quantity, when used for power production as planned by Egypt, might produce a surplus. Finally, coal reserves if found might provide a basis for a regional project.

In addition to shared power sources which could lead to cooperation, a regional grid for some or all of the countries might make sense in and of itself, since the larger marketing area would permit economies of scale both in terms of the size of the power plants and in terms of total generating capacity (i.e., the larger the area the less the burden of peak load and reserve generating capacity on individual countries). As Syria is now selling its low cost hydro power to Lebanon and Jordan, already the beginnings of a regional grid already exist. Further expansion would logically interconnect Israel with Jordan and possibly directly with Syria and Lebanon on one side and Israel with Egypt on the other.

The interconnection of Israel with Egypt is a distinct issue which can be treated separately from the interconnection of Syria, Jordan, Lebanon and Israel. It involves such considerations as Egypt's plans for developing the Sinai; the availability of natural gas; and the availability and relative desirability of other sources of power for Israel.

International interconnections require careful study to assure that they are economically and financially viable (there appear to be no major technical obstacles). A high degree of cooperation is required in the planning, operation, maintenance and most importantly in restructuring plans for construction of new power generation facilities.

In attempting to assess the potential for regional cooperation in power generation and transmission, several factors appear to be critical. The most important factor is the availability of economically attractive energy sources sufficient to generate electricity surplus to the needs of the owners of the energy resources. In addition to physical availability, the national interests of the countries must be taken into account even in the context of peace since no country will wish to be overly dependent on one source of supply and one type of energy. Even from the technical point of view it is not wise for a national system to depend on one source of supply and one type of energy or to depend on one source for too large a portion of its power.

Findings

An Egypt-Israel power connection will require careful study to determine whether it is a feasible project. Egypt is a large country with a growing economy that requires large amounts of power for industrial, commercial and residential uses. Power already is in short supply and is unreliable because so much is generated by old inefficient plants. This situation may continue for some time even if Egypt carries out its power plant construction plans on schedule because demand is increasing more rapidly than supply. Egypt's gas reserves are not enormous and other sources of energy will be needed in time.

The need to provide power for the Sinai will result in the construction of either gas-fired thermal stations in the area, coal-fired plants if coal reserves are sufficient

or the transport of power to the area by high voltage transmission lines. Israel may have a short-term power surplus after completion of two large coal-fired thermal units presently under construction. If the spirit of cooperation prevails and long-term benefits from a power interconnection are perceived by the two parties, they might cooperate in this sector with Israel initially providing power to the Sinai, and later receiving power from Egypt as its supply-demand situation reverses itself.

Jordan would benefit greatly from a regional grid. Given the relatively short distances involved, the interconnection of Israel, Syria, Jordan and Lebanon should be studied carefully. The viability of this grid may depend in part on how quickly Syria's surplus will disappear, and whether or not there exists other sources of power which could be shared. Such a regional grid likely would be relatively easy to construct, requiring only short lengths of high capacity transmission lines with related transformer stations, and would be beneficial to all parties because of the economies of a larger market which would in turn reduce the capital each country would have to invest in peak load and reserve power generating facilities.

The potential for generating hydro-electric power offered by the difference in levels between the Dead Sea and either the Gulf of Aqaba or the Mediterranean should be considered in this context. Israel is investigating such a project. Sea water would be brought from the Mediterranean by conduit to a power station on the Dead Sea. There is a serious risk from leakage which could contaminate agricultural land and could contaminate ground water aquifers. Despite the low operating costs which usually are associated with hydro power, the initial investment when compared to other sources of energy and the attendant risks may make the project unfeasible.

Though Israel is studying this possibility purely as a national project, Israel's ability to sell and buy power through a regional grid will affect the economics of the project. Additionally, the flow of water into the Dead Sea would affect the salinity and level of the Dead Sea, a matter of concern to both Israel and Jordan. Clearly, the project requires additional study in a regional context. It would require cooperation between Jordan and Israel. Based on this initial appraisal, we would assign low priority to this project possibility at this time.

The above analysis is based on known energy resources. Only limited exploration has been undertaken for coal, and to date only Israel has sought to move toward coal for energy. There is some minable coal in the Sinai and northern Syria. Further exploration for coal and a study of the economics of using coal in lieu of or in addition to other energy producing materials, may be of interest to one or more of the countries. Further study and contact with the parties would be needed to accurately assess these possibilities. Even if large quantities of coal are not available within the region, Egypt, whose oil and gas reserves may not be sufficient for all its needs, and Israel, which is already turning to coal, may wish to study imported coal as an energy source because the cost of electric energy from coal fired plants is potentially more economical than nuclear power plants and generally less expensive than electricity from oil fired plants.

Additionally, geothermal resources might be sought on a joint basis if preliminary surveys indicate a potential for this type of energy source. There appears to be little prospect for geothermal energy on the Egypt-Israel side of the region, but the Rift Valley may have potential and would warrant further investigation.

Considerable interest has been expressed regarding the possibility of joint nuclear power projects, particularly in the Sinai and in connection with desalination. Leaving U.S. policy and regional political considerations aside and viewing nuclear power generation on the technical and economic merits alone. It is difficult to be optimistic about the feasibility of such schemes, since lower cost methods of producing power appear to be available in the region (i.e. hydro and currently flared natural gas). The order of magnitude of such a plant to provide real economies of scale would present problems for national systems since the plant might represent an overly large percentage of system capacity. Further study, perhaps as part of a larger research scheme involving desalination or a regional power grid, may be warranted at some point in the future, but this should receive low priority for immediate attention.

There are no sources of electric power or power transmission lines in the Sinai. Egyptian plans for the development of this region undoubtedly include construction of power infrastructure. As noted above, this development offers the possibility of cooperation with Israel if Egypt desires to cooperate.

Jerusalem is connected to the Israeli national grid as are a few West Bank towns. However several towns in the West Bank have independent generating capacity. Interconnection of West Bank towns with the Israeli grid is a sensitive issue and a source of friction between the municipalities and the Israeli military government. Israel should have adequate power to serve the West Bank where Jordan does not. A regional grid with a high voltage connector between Israel and Jordan via the West bank would permit the provision of power to this area regardless of the final arrangements for its political future. All of the Gaza Strip has been connected to the Israeli grid. Clearly, Israel can continue to provide the area with power while Egypt could not unless the connection to Egypt was done as part of the overall development of the Sinai. The economics of a transmission line from Egypt to Gaza or an independent system would need careful study.

B. Solar Energy

Summary

The climate of the Middle East is extremely favorable for the utilization of solar energy. There is considerable interest among the countries in solar energy and a great deal of research, development and demonstration is underway.

A Department of Energy evaluation of possible energy cooperation suggests that the best potential for cooperation lies in applications of currently available solar energy systems and of those systems currently being developed by industrial countries rather than R&D on advanced solar energy systems. Egypt, Israel and other countries could mutually benefit from sharing work and experience in solar applications since many of the problems and environmental conditions in the region are similar. Solar water heaters, other solar heating applications, solar ponds, photovoltaic power systems, and solar thermal power systems are among the areas which could begin to be applied in varying degrees. Cooperative efforts could be mounted quickly and could have visible results in the short term.

Background

The climatic conditions of the Middle East make it one of the most favorable areas of the world for using solar energy. The countries have shown considerable interest in this area and are proceeding in various ways on their own.

Israel is far out in front in R&D, and in the use of solar heating systems, but Egypt and Jordan also have great interest and are beginning efforts to assess and apply solar systems. Solar heating is widespread in Israel and a number of Israeli companies are manufacturing solar heating equipment. Egypt has been doing development and test work in solar heating and has recently issued a tender for solar heaters and has development and test experience in several solar systems.

Solar energy applications are of great interest in Jordan. Particular emphasis is currently being given to desalination of small water supplies from brackish sources. Solar energy applications also are being directed at rural and desert development concepts such as home hot water heating and communications, and use of solar-cell powered micro-wave telephone communications to connect rural settlements with outside facilities. The Royal Scientific Society has a newly installed solar energy station at Aqaba. Plans for expansion include a project for electrical production from solar-driven turbine generators in cooperation with the U.S. government, and a heating/cooling project in cooperation with Kuwait.

Findings

Solar energy is one of the more promising fields for Arab-Israeli cooperation. The similarity in environmental conditions among the countries makes the research, applications and operating experience of one country more applicable to the others than that of U.S. or European countries. The problems faced by the countries of the area are similar and the technologies and approaches could be in large measure interchangeable. It is thus an area where cooperation could have significant benefits to the parties. Since all the countries are active in the area, cooperation could be begun quickly, and could lead quickly to visible results. Cooperation in research on new technologies would be useful as a form of S/T cooperation but the best near term opportunities lie in the adaptive engineering demonstration and application of energy technologies. Putting the systems into effect to increase energy supplies is what is most needed.

Cooperative efforts could be conducted in the following technologies:

- other solar heating including crop drying
- solar ponds
- photovoltaic power systems
- solar thermal power systems

The types of programs should take into account the stage of technology development of each country. For example, the solar water heater technology is an established commercial capability in Israel. Cooperation with Egypt and other Arab countries should be directed at extending this commercial capability to the larger regional market. Solar ponds are not yet at the same stage but are certainly in an advanced stage of development. Regional cooperation therefore should involve demonstrations leading to early application of solar ponds. Solar heating applications to crop drying and other agricultural needs can involve low level technologies using engineering adaptations of other heating concepts such as solar water heating. This could proceed into an early demonstration phase followed by applications directed programs. Solar photovoltaic and solar thermal applications are in a less advanced stage of development, and require a greater degree of systems and cost engineering before commercial applications could be pursued. Accordingly, cooperative programs in these areas should initially be directed at the adaptive engineering of systems being developed by others before proceeding into large scale demonstrations and follow-on applications.

Elements in the application of solar water heaters in the Arab nations would focus upon: (a) transfer of technology including demonstrations in-country; (b) establishing manufacturing, marketing, installation and maintenance capabilities in-country; (c) training of personnel at engineering, marketing, craft and technician levels; (d) examining economic conditions and revising them as necessary to remove disincentives or provide incentives for the use of other systems; (e) removing regulatory or social/cultural inhibitions on their use; and (f) developing adequate financing both on a national/corporate scale and at the individual owner level.

Elements in any program involving solar ponds and solar agricultural applications would place greater emphasis initially on demonstrations combined with a local condition or site-specific engineering emphasis. It would shift toward the type of solar water activities noted above subsequent to this initial phase.

Elements in a solar photovoltaic or solar thermal program initially would emphasize cooperative technology development system engineering and cost evaluation and engineering activities. This would be followed by in-country demonstrations and, eventually commercial or other applications-directed activities similar to those described above.

Another area of considerable promise involves combining solar power production with small scale brackish water desalting (this is treated in the section on desalination).

C. Natural Gas Utilization In The Sinai

Summary

Construction of a natural gas pipeline from Saudi Arabia to the Sinai to furnish energy for construction of a major industrial and power generation project has been suggested as a basis for development of a regional industrial complex. The Department of Energy assessed the parameters of such a project and in the process also reviewed natural gas utilization generally. Preliminary indications are that such a large scale project faces substantial economic obstacles which on their own appear to make the project unfeasible. For example, the cost of Saudi gas and the products to be produced are likely to be high. However, a systematic evaluation of the proposal might still be undertaken if the regional participants were willing to cooperate and if various other problems could be overcome.

Background

Of the three locally available natural gas reserves, only Saudi gas is of sufficient magnitude to support either all or even part of a large joint project.

Israeli reserves are small. In addition, the newly discovered deposit at Sadat in the Sinai contains only 30-50

billion cubic feet of gas. While there may be sufficient gas for Israeli use as a power source, the size of the current known deposit is insufficient to support a major multifaceted industrial project.

Egyptian officials are giving more attention to their natural gas resources. Current reserves of the three known fields amounts to over 3 trillion cubic feet. Current production from two of these fields equals 75 million cubic feet a day (mcf/d) with production from a third to begin this year. This latter production is dedicated to a fertilizer plant and a thermal power station. Associated gas resulting from Gulf of Suez oil production stands at 280 mcf/d, of which 240 mcf/d is being flared. A World Bank team recently visited Egypt to investigate the possibility of financing a gas gathering project for pipeline delivery to Suez for use in another fertilizer and power plant. This project would utilize only 80 mcf/d of gas. Although no companies are currently exploring for gas, finds are being made in the Delta and contiguous offshore areas as a by-product of oil exploration. For the foreseeable future, however, Egypt is likely to dedicate any newly discovered gas to other priority uses such as power generation.

Gas reserves of the Arab OPEC countries are enormous and exceed 388 trillion cubic feet (TCF). Iran has an additional 600 TCF. In 1977, however, on the average over 76 percent of natural gas production was flared. Virtually all of the Arabian Gulf states have plans to utilize this flared gas. The largest project being undertaken is in Saudi Arabia.

Scheduled for completion in 1982, the Saudi project will gather and process approximately 3 billion cubic feet a day (BCF/D) of associated gas from three of Saudi Arabia's largest oil fields. Completion of the project will allow approximately three-fourths of the gas presently being flared to be collected. At oil production levels of 8 million barrels a day, one BCF/D will still be flared and, assuming it is technically feasible, available for use.

Findings

Any feasibility evaluation would need to determine, inter alia, the economics of gas gathering and the pipeline transport of Saudi gas to the Sinai; the type and size of an industrial project, i.e., building materials,

industry and steel-making needed to effectively utilize the volumes of gas; the terms of the project's payout and whether the project would require a significant export orientation to guarantee its viability, or if a solely development related project would be feasible.

A major Egyptian concern would be the rationale for treating such a project as a regional one involving Israel. Egypt would have to be convinced that the development related benefits it could capture in cooperating with Israel would exceed those of its proceeding alone or in concert with Saudi Arabia.

The Saudi government would have to determine that the gas to be supplied would be surplus to its needs and that greater benefits could not be captured through its use in other projects. In this regard, the Saudi's would have to be willing to price the gas at the wellhead at or near zero to encourage the Sinai project's economic viability.

Given the very slim chance a gas-based regional industrial project has of overcoming supply problems and the lack of a real need to include Israel in any event, a study of the project proposal appears to have a very low priority.

Should the supply uncertainties and obstacles be overcome, the type of products manufactured would have to be investigated. A joint Arab/Israeli industrial development center might utilize natural gas and natural gas liquids to upgrade basic raw materials to semi-finished or finished products. Raw materials for ferrous and non-ferrous metals products, cement manufacture, and other basic industry could be used. Dry natural gas could be converted to: hydrogen for direct iron ore reduction; ammonia and derived nitrogenous fertilizer for regional use and possibly export; alcohols and other oxygenated products. Natural gas could be used as process fuel and for power generation throughout the complex.

There are two additional uses of natural gas, as liquified natural gas (LNG) and as a feedstock for the petrochemical industry, but these are less attractive as a basis for a joint project. Saudi Arabia is establishing a major petrochemical industry and, given current depressed demand and world overcapacity, is unlikely to

encourage construction of additional competing capacity. Saudi Arabia also anticipates being a major exporter of natural gas liquids in the 1980's. The world market for liquified natural gas has not developed as expected and additional capacity may not be required. Proceeding with either liquified natural gas or petrochemical industries would likely cause disruptions to international trade and might only be possible in conjunction with increased domestic tariff protection. Finally, the long-term employment benefits to Egypt appear better with development of an industrial project.

Chapter VIII INDUSTRY AND MINING

A) Industry

Summary

There is only limited potential for cooperation in joint industrial projects between Israel and one or more of its neighbors in the short run. Israel and its neighbors have limited quantities of physical resources such as agricultural land, manufacturing capacity and minerals which might be developed over time to provide a basis for regional joint ventures (e.g. agribusinesses involving food processing and the production of minerals from the Dead Sea). However, there is no immediate inherent advantage, economic or otherwise, and significant constraints exist on the joint exploitation of such resources. Israel does have a pool of skilled managers, technicians and workers on which it could draw though it has no real labor surpluses. Its Arab neighbors, particularly Egypt, have some unemployed or underemployed unskilled labor. Even in the context of peace, national sensitivities likely will impede the formation of regional joint enterprises based on the human resources.

Since joint industrial ventures will be acceptable only after a lapse of time, it would appear best to concentrate on establishing trade relations to open regional markets for raw materials and finished products. This would have the advantage of introducing the business communities of the region to each other and helping them to become familiar with the manner in which business is done by their counterparts. It also should lead to expanding business relations, perhaps the sale of technologies, the provision of technical and managerial assistance and finally, if the environment allows, joint industrial enterprises.

Background

As a region, the Middle East retains a strong rural orientation with nearly one third of its population drawing a livelihood from agriculture. This is particularly true of Syria, Iraq, the West Bank and Gaza, although considerably less so for Lebanon, Israel, Jordan and, increasingly, Egypt. Food production generally has not kept pace with population growth.

The proportional importance of agriculture in the region, however, has gradually diminished in the last thirty years through continuing rural-urban migration, increasing urbanization and varying degrees of industrialization. Industrialization in particular has progressed considerably in Egypt and Israel. Although both of these countries have developed some heavy industry and Egypt has the potential to develop a diverse base for capital goods production, most manufacturing in the Arab countries is small scale.

In Israel a sturdy industrial foundation has been laid, with many if not all the forms and supporting institutions usually associated with a modern industrial society. Israeli industry already has the manufacturing and marketing capability in many areas of production to compete successfully in world markets.

Throughout the countries of the Middle East, much of the industrial development that has occurred so far has been in the nature of import substitution, although export oriented investment has predominated in recent years in Israel and is growing in Egypt.

Israel has exhausted most of its potential for agricultural expansion because of land and water shortages. Apart from potash and phosphates it has few other natural resources to build on. Some additional potential for agricultural development exists in Egypt, Syria and Iraq. While population growth might affect the availability of some agricultural products and agricultural land in the future, this is not likely to be the case for cash crops such as citrus and winter vegetables which are the ones most likely to be utilized in food processing. Apart from hydrocarbon deposits in the Arabian peninsula, however, the Middle East is not richly endowed with raw materials. The natural advantages that do exist in the region for production of such products as textiles, fertilizers, cement, glass and leather production are already largely exploited on a national basis.

Population growth is high in the Arab countries, but demand for labor also is rising rapidly. Indeed, migrant labor has become a major earner for the non-oil Arab countries. At present there are no real surpluses in Israel though the total pool of labor is large enough to supply skilled personnel to regional projects if there is an incentive. Egypt still has some underemployed and unemployed workers. Syria and Jordan are becoming short of

labor, with Jordan bringing in Egyptians and Asians. The labor situation on the West Bank and Gaza will be clear only in the context of a peace settlement at which time the position of Palestinians employed in Israel will be determined and the prospects for returning refugees will be clarified. Skilled and semi-skilled workers in the Arab countries are drawn to the oil producing states by high wage rates creating shortages of specific skills.

The future of industrialization in the Middle East will lie in the more efficient operation of existing industrial capacity and the more rational allocation of investments based on specific comparative advantages. It also depends on further development of the productive capacity and labor skills. In this regard, some countries, notably Israel and to a lesser extent Egypt, already have developed considerable capacity to manufacture armaments primarily through imported raw materials. Given peaceful relations, such capacity could be redirected to more socially and economically productive purposes but this will not occur rapidly under the best of circumstances.

Findings

The movement of labor from those parts of the Middle East that do not enjoy large oil income to those that do may be a constraint of significance to the labor exporting countries, since particular types of skilled or semi-skilled worker may not be available. Wages may be expected to grow rapidly in response to demands arising from the growth of national industries as well as the oil producing states.

There is a critical shortage of investment funds, particularly for enterprises that require foreign exchange in the Arab states. Capital is in short supply for national industries and regional ventures would have difficulty competing for both debt and equity financing given the constraints discussed above and the limitations on physical resources. This may improve under conditions of peace.

The lack of physical resources available for productive use in joint industrial ventures, the uneven distribution of skills, competition for labor and other constraints suggest that cooperation in the industrial sector is likely to emerge slowly.

Joint industrial enterprises would have to concentrate on modern production processes and on relatively high value products for the export market. They could not rely only on the expansion of domestic markets or on import substitution in the domestic market in the short term. Though expansion of markets in the Middle East region has significant potential, it must be approached slowly and carefully.

Initial efforts should focus on the stimulation of trade relations which will permit the business communities of the region to come to know each other better. Trade should lead to the identification of joint projects by the business communities as a result of this interaction and joint industrial enterprises will take shape with less effort on the part of all concerned and certainly a higher probability of success.

B. Minerals

Summary

A review of the mineral resources of the region indicates that the two primary products produced by Egypt, Israel and Jordan are potash and phosphate. These countries thus are competitors. The only mineral resources which are in any way regionally shared are the Dead Sea evaporites which both Israel and Jordan use. However, Israel has constructed and Jordan is constructing the facilities they require to exploit these resources nationally, and there appears to be little scope for cooperation on the facilities themselves. Cooperation in technology is a possibility. In general, each nation requires its mineral resources for economic growth and development either through domestic use or for export. They are not likely to cooperate in the near term as there is no clear cut advantage to doing so. In the long term, exchanges of technological information and perhaps even joint research may be possible. Also, some trade in refined metals may be possible, particularly exports from Egypt to Israel.

Background

Egypt possesses large deposits of petroleum, coal, phosphate, iron ore and other minerals. Egyptian oil fields currently produce about 20 million tons of crude per year, while the combined annual output of phosphate and iron ore mines has reached a total of 1,700,000 metric tons. Mineral

production forecasts indicate that about 50.5 million tons of crude oil will be produced annually in Egypt by 1982, most of it for export to European markets. Iron ore output is expected to be 3.1 million tons per year by 1980. Phosphate production could reach 9.1 million tons yearly in 1985, most of which will be sold to Europe, Asia and perhaps East Africa.

As far as Israel is concerned, minerals are limited to potash and smaller amounts of bromides, magnesium and other salts in the Dead Sea, and to small, low-grade phosphate rock and copper deposits in the Negev. Only minor crude oil and natural gas deposits have been discovered. While production of copper ceased in 1976, Israel currently produces 1.2 million tons per year of potash and phosphate each, a combined output of 2.4 million tons annually. Most of Israel's potash and phosphate production is exported to Europe, the U.S. and Latin America.

The mining sector continues to provide the brightest news for the Jordanian economy. The country's known mineral wealth lies predominantly in its phosphate reserves which are estimated at about 3,000 million tons (proven reserves which are 508 million tons). Rich beds of phosphate exist as Ruscifa, a few miles northeast of Amman, and in the El Hasa area, south of Amman. In 1977 the country's total production of phosphate rock was about 2 million tons. However, phosphate production is unlikely to reach the planned target of 7 million tons by 1980; it may reach 4 to 5 million tons by that year. Phosphates are Jordan's biggest single export commodity, accounting for 39% of foreign currency earnings in 1976. In view of the worldwide trend toward integrated plants for phosphatic fertilizers, growth of phosphate rock exports is expected to be limited in the long term. As a result, a new fertilizer plant is being constructed south of Aqaba which would enable Jordan to process a substantial volume (1.3 million tons/year) of its phosphate rock deposits. There also are good prospects for exporting one million tons of potash per year at peak production after the Arab Potash Project on the southern end of the Dead Sea is executed and if careful marketing is arranged. Production of bromides, magnesium and other salts from the Dead Sea should be developed in the future.

Syria's production of phosphate rock started from mines in the Palmyra area in 1972, reaching 800,000 tons by 1977. Exports of phosphate totaled 700,000 tons in 1977, half of which was bought by Romania, the rest going to North Korea, Lebanon, Poland, and Bulgaria. The North Koreans, however,

already have taken 100,000 tons of Syrian phosphate during the first quarter of 1978, and may yet become Syria's major customer. Syrian phosphate is of poor quality and sells at a relatively low price. With world phosphate prices declining lately, Syrian revenues from this mineral have suffered proportionately. Nevertheless, current plans call for phosphate production to increase from 1.35 million tons to 4.5 million tons by 1980, of which 4 million will be for export and 0.5 million for use in a triple super-phosphate fertilizer plant.

Syria's annual oil production in 1978 was projected to be 15 million tons, most of it for export to Western Europe and the USSR. Barring any new discoveries, oil production is likely to stabilize at that level. With growing sales abroad, oil has become Syria's most important export commodity. The country's proven oil reserves stood at 2,150 million barrels at the end of 1977.

Lebanon's domestic resources of industrial raw materials are scarce. Mineral resources include a small iron ore deposit at Marjaba, about 10 miles northeast of Beirut, which has been mined since 1953 and smelted locally. Abundant limestone deposits suitable for the production of good quality cement have been found south of Tripoli. There also are a few lignite deposits southeast of Tripoli and northeast of Beirut.

Because the Dead Sea is shared as a resource by Israel and Jordan, it requires special attention. The Dead Sea is extremely rich in minerals; about 35 percent of its water consists of minerals in solution. The primary mineral extracted so far has been potash. Bromine and magnesium are produced from the residual brine of the potash refinery. Both minerals are extracted in Israel and are planned to be produced in Jordan. The Israeli operations started about ten years ago. They include large evaporation ponds at the south end of the Dead Sea (Sedom) and refineries at several locations. The Jordanian plant will be separated from those of the Israeli Dead Sea Works by a flood channel of sufficient capacity to pass flood waters from the southern wadis into the Dead Sea. Jordan, acting through the Arab Potash Company is now constructing a township and is expected to let the first of three construction contracts early in 1979. At that time the Arab Potash Company will have committed about 50 percent of the construction funds, and thus will have passed the "no return" point in implementing its potash project.

Findings

Whether it would make technical and economic sense to envision joint production by Israel's Dead Sea Works and Jordan's Arab Potash Company of other materials, such as magnesium and bromine, has never been explored but could be examined. There would, without doubt, be technical problems in such joint operations since the waste brine from both plants would be needed for production.

There are, however, more promising areas of cooperation. Jordan could use the experience gained by Israel during its ten years of operating the Dead Sea Works and associated production facilities. The Israelis might be willing to sell, and the Jordanians to buy, technical know-how, provided mutually acceptable terms could be agreed upon. Similarly, research and development relating both to the production of other materials now being extracted could be organized on a cooperative basis.

Minerals now being mined, processed and marketed separately by Jordan, Israel, Egypt and Syria - principally phosphate rock - do not lend themselves readily as a basis for cooperative ventures. The deposits are located fairly far apart and marketing arrangements focus on different regions and involve in some cases arrangements with producers in other geographical regions.

Exportable oil presumably will be marketed by Egypt and Syria commercially as in the past; neither Israel and Jordan have exportable oil or natural gas. Egypt might be able to sell coal and iron ore to Israel.

Chapter IX: TOURISM

Summary

Information currently available to our contractor, which is spotty and to some extent of questionable reliability, indicates that, while peace between Egypt and Israel will enhance the growth of tourism in the region, it is unlikely that peace will bring about overnight quantum increases in the already strong tourism growth trends for the region. In fact, increased circuit tourism could result in shorter stops in one country, with a loss of tourism earning. Increases in the number of tourists, of course, would offset this loss.

Peace will permit the preservation of the already high rates of tourist growth. Peace also will permit the kind of cooperation that will encourage circuit tourism, speed the flow of sun-seeking Europeans into the Red Sea and Gulf of Aqaba as well as the Mediterranean coast and perhaps most importantly, permit a major international cooperative effort to survey, catalogue, preserve and display the antiquities of the region which will require enormous amounts of capital and technical expertise.

Background

Total foreign traveler arrivals in the Middle East over the last decade have risen to about 3.5 million per year, a threefold increase in ten years. Of this total, 3 million FTA are from Arab countries and the balance, 1.5 million, are from Western Europe and North American. This remarkable growth appears to have occurred despite political uncertainties, terrorism and other politically related events.

While few details are known about Arab tourists other than the order of magnitude of the group and some preliminary information on lodging preferences, available data does indicate that this group can be expected to grow significantly. This growth will probably be tied to increases in disposable income which are related to oil production and prices. In addition, Western European and North American tourism is expected to grow significantly, since one large element of this group consists of western European workers who receive long paid vacations which are taken by seeking the sun and sand of the Mediterranean. This group already has grown sufficiently to have saturated the European side

of the Mediterranean and has begun to spread along the North African side. If past trends hold, this special category of tourist will move in advance of the construction of hotels and resorts. In ten years a portion of this group can be expected to seek resorts in the Red Sea and Gulf of Aqaba.

Tourists from Western Europe and North America, to a large extent, already engage in circuit tourism; they visit one or more countries en route to/from one of the countries in the region. Those visiting Egypt have the opportunity to visit Jordan, but generally visit Egypt as part of an East African, North African, or a Western Mediterranean tour. Those visiting Israel generally stop in Athens or other European points. However, circuit tourism is restricted within the region and uncoordinated. Open borders will permit greater intraregional tourism, but joint planning and encouragement, including diversification of entry points into the region, would be required to truly promote circuit tourism.

In the period following the 1967 war, including periods of conflict with Israel, Egyptian tourism grew at about 14% a year. Foreign tourist arrivals for Egypt rose from 150,000 per year in the mid-1950s to about 600,000 in 1966. The war cut this in half, but the 600,000 level was regained by 1973. By 1977, tourist arrivals reached 1.1 million. In the mid-1950s, about six out of every ten tourists were Europeans or Americans and the other four Arab. By 1976, this proportion had almost reversed. Statistics indicate that the reversal began before the conflict in Lebanon and the rise in oil prices. Estimated foreign exchange earnings from foreign travelers in 1978 was nearly \$1 billion.

In Israel, tourist arrivals also have risen significantly from 300,000 in 1967 to one million in 1977. The Israelis believe there has been an eightfold increase in foreign exchange earnings from tourism in the 1967-1977 period. Earnings in 1977 were probably over \$700 million.

Jordan has shown a major growth in tourism, from 230,000 in 1971 to 750,000 in 1977. Estimated earnings from foreign travelers in 1977 were \$300 million.

The Gaza Strip has little at the present time to attract tourists, though resort construction may be possible. The West Bank, of course, is a major tourist center and presumably will remain so regardless of the final political settlement. Peace and a political settlement will certainly affect the number of tourists in the West Bank as Arab tourists begin

visiting holy places and family. Generally all of the above comments, with regard to tourist growth, support of public and private infrastructure, and preservation of antiquities, apply to the West Bank regardless of who has political control of the area.

Recognizing this growth, the concerned governments have encouraged the construction of international-class hotel accommodations. In Egypt, hotel rooms increased from 6,000 rooms after the 1967 war to 9,000 in 1974. Statistics on hotel starts indicate that the number of rooms may have doubled and the current plan of the government of Egypt is to again double the number of hotel rooms. Despite all of this, hotel space in Egypt is still in very short supply. Based on previous experience, it takes 10 years from planning to opening a hotel in Cairo. Jordan had 1,202 rooms in 1975 plus 653 under construction in 1976 with a target of over 3,600 by 1980. Israel has authorized construction of 3,000 new hotel rooms.

It is possible that the hotel starts did not result in completions, so the actual number of rooms may not be as great as planned. It is interesting to note that Arab tourists appear to make only limited use of international-class hotels in Egypt which, in part, explains why the great increase in tourists has not caused greater problems there than already are evident. This set of tourists apparently prefer to stay in boarding houses, condominiums and villas depending on their level of wealth. Many are middle-class Arabs working in the oil-producing states, and represent a growing and important market.

Another aspect of tourist growth is the profitability of investments in this sector. Data for 1974 shows that gross operating profits, as a percentage of sales, averaged 40% for the region (Egypt -- 48%, Lebanon--42% and Israel--32%). Break-even hotel occupancy in Cairo is only 35% to 40%. In 1974, hotel occupancy was 92% and in 1978, 130%. This figure, like a lot of others in this section, is suspect.

In addition to all the above, which demonstrates that tourism in general and Arab tourism specifically has been growing strongly, one more trend is worth noting, given its potentially enormous impact on the Middle East over the next ten years. Studies indicate that there is a major movement of vacationing sun-seekers pushing south and east out of Europe. This group already has moved down the Spanish, Portuguese and French Mediterranean coasts and crossed over to

North Africa. It definitely is moving toward Israel, Egypt, and Jordan, and in ten years could be into the Red Sea area. The group consists largely of European workers who are increasingly better paid and are members of unions that, in cooperation with the European travel industry and other investors, have in effect created vertical travel monopolies (a) providing packaged tours to members, (b) to resorts in which the unions have invested, and (c) on airlines in which the unions have an interest. The union members generally receive 3 weeks of paid vacation and their unions are now pressing for more. The group does not, however, wait for the construction of resorts and does not by and large seek international class hotels in major urban areas. It currently is estimated at 65 million.

A restricted system of uncoordinated circuit tourism appears to exist already in the region. The restricted aspect stems from the fact that tourists cannot move freely among the five countries of the Middle East which are focus of this study. It is uncoordinated because there is no general planning for such tourism nor a coherent strategy to promote it. As an example, it appears that three-quarters of foreign traveller arrivals from Western Europe and North America in Egypt are part of an organized tour which includes Egypt as part of either a North African, East African, or Western Medetarranean circuit. Most tourists in Israel stop at some intermediate point as well, often Athens.

Findings

Based on the above, it seems reasonable to conclude that peace between Egypt and Israel will have some immediate effect on tourism, but not of the dramatic dimensions that frequently have been mentioned. Open borders will attract more tourists, but over the short run countries may lose some foreign exchange earnings as tourists take advantage of the open borders to visit nearby countries. Over time the loss would be made up by increases in the total number of tourists. A positive strategy developed by the countries of the region is necessary to ensure that all receive the benefits from circuit tourism. Positive promotion to bring tourists from outside the region is necessary to ensure that it is additive to national tourism which already is growing at high rates in each of the countries of the region. Studies show that circuit tourists tend to be more experienced travellers who value time spent outside major urban centers and who on the average spend twenty percent more time and a proportionately greater amount of money than ordinary tourists

To support the growth of regional tourism, each country will have to be prepared to invest in improved regional infrastructure as set forth in the Telecommunications and Transportation sections of this study. They also will have to remove constraints on the construction of appropriate facilities for tourists. They will have to cooperate in the diversification of entry points into the region.

Regarding hotel accommodations, statistics indicate that profitability is sufficiently high that only peace and a minimal encouragement by the governments would be required to promote private investment. However, international class hotel space already is in short supply. Construction time and limits on trained manpower will hinder rapid increases in hotel rooms. Fortunately, Arab tourists do not appear to rely on hotels. They seem to prefer boarding houses, condominiums and villas depending on their wealth. Also the sun seekers do not generally go into the major urban areas. Finally, circuit tourists appear to prefer to stay outside major urban areas near or in the sites of interest. This argues for development of archeological parks with facilities near by or "tucked in." It also indicates that small 100 to 500 unit self contained resort complexes which are easy to construct and simpler to manage than major hotels would be highly profitable and would permit the countries of the region to take advantage of the impact on peace more rapidly.

The whole area of surveying, cataloguing, preserving and displaying the historic and natural wonders of the area is one which requires immediate international attention and it is clearly of major importance to all the countries. It is an area that requires considerable capital which will have to be provided by external donors and expertise in preservation and display that also may have to come from outside the region. Without attention, the rich heritage of the area which attracts tourists will be lost. With attention, tourism of all types will be increased. This is an area in which the National Park Service has had previous area experience under a USAID project in Jordan.

APPENDIX A

Contractors and Technical Studies Conducted

Copies of the reports of the various agencies and contractors are on file in A.I.D. (Near East Bureau, telephone 632-8532).

<u>Subject</u>	<u>Agency or Contractor</u>
1) Transportation	Department of Transportation
2) Telecommunications	Teleconsult
3) Science & Technology Overview	Herman Pollack, George Washington University
4) Health	Office of International Health, DHEW
5) Agriculture	William Scofield, consultant under contract to the Dept. of Agriculture
6) Marine Sciences & Meteorology	National Oceanic and Atmospheric Administration
7) Education	Don Peretz, SUNY Binghamton, under contract to AMIDEAST
8) Social Sciences	Louis Cantori, University of Maryland Raga Elim, Kent State Univ.
9) Manpower Planning	ILAB, Dept. of Labor
10) Appropriate Technology	Ali Seireg, Univ. of Wisconsin
11) Environment/Natural Resources	University of Arizona
12) Water Resources	William Romig, A.I.D. consultant
13) Desalination	Office of Water Research and Technology, Dept. of Interior, utilizing Oak Ridge National Laboratory

<u>Subject</u>	<u>Agency or Contractor</u>
14) Energy	Department of Energy
15) Industry	Robert Nathan and Company
16) Tourism	Quarry Hill Inc.
17) Commercial Clearing House	CAGNE, Dept. of Commerce
18) Financial Institutions	Dept. of Treasury
19) Indicators of Scientific and Technological Efforts in the Middle East	Computer Horizons, Inc.

In addition to the above, the National Academy of Sciences held a "Discussion Seminar on Regional Science & Technology Development in the Middle East" as a part of this study.

SUMMARY DESCRIPTION OF WEST BANK AND GAZA ECONOMIES

I. Summary

The economies of the West Bank and Gaza^{1/} have grown rapidly in the past decade based on the earnings of workers in Israel, Jordan and the Arab oil states, and the rapid modernization of agriculture. The new prosperity, which is clearly visible, has led to a housing construction boom, but little investment has gone into productive activities. Industrial development in the Occupied Territories has been carried out mainly by Israeli firms which, attracted by the relatively low wage rates and taxes, produce components for their Israeli operations.

Agriculture is still very important in the economies of both areas, accounting directly for 33 percent of employment and 31 percent of Gross Domestic Production (GDP) in the West Bank and 25 percent and 33 percent of employment and GDP respectively in Gaza. Industry's share of GDP is less than 10 percent, and much of that is related to the processing of agricultural products. The future growth of agriculture in the Occupied Territories will depend mainly on more efficient use of land and water because additional supplies of each are quite limited.

The West Bank and Gaza are full employment economies - the unemployment rate is under one percent. Underemployment is also declining. The boom in the Territories and the attraction of jobs in Israel and the Gulf states have drawn excess labor from agriculture and the refugee camps. In fact, some kinds of labor are in short supply. However, to keep unemployment low in the years ahead will require a continuing high rate of economic growth to absorb the large numbers of youths about to enter the work force and the reservoir of women who are just beginning to take jobs outside the home.

The economies of Gaza and the West Bank, which are not complementary to each other, are now closely integrated into Israel's economic system, much to the discomfort of many residents of the Occupied Territories. Nearly one-third of those from the Territories who have jobs work in Israel, and their earnings account directly or indirectly for nearly half of West Bank and Gaza GNP. The Territories receive 91 percent of their imports from Israel and send Israel 61 percent of their exports. Communications, transportation and power systems have also become closely intertwined over the last decade. In certain areas, however, such as education, tax systems, finance, banking and public attitudes, Israel

^{1/}Gaza, the Strip, and the Gaza Strip are used interchangeably.

and the Occupied Territories remain far apart.

The Occupied Territories are able to finance large deficits in their merchandise trade accounts by the remittances of their workers with jobs in Israel and elsewhere. In addition, considerable savings in the form of gold and foreign currency have been accumulated and are held in Gaza, the West Bank and abroad. A major developmental problem facing the Territories is how to combine these funds with the necessary entrepreneurial and labor skills to promote economic growth.

II. Framework of Analysis

This study is not intended to be exhaustive. Rather the aim is to present a broad overview of the existing economic conditions in the West Bank and Gaza and to enumerate those important economic factors which should be considered regardless of the political shape which a peace settlement involving the Occupied Territories might take. The central focus will be on current levels and patterns of economic activity in the West Bank and Gaza and the major constraints to and opportunities for economic development.

Any economic analysis of the West Bank and Gaza should contain an early and strong warning about the unreliability of the data available. Part of the problem is that no separate data for the areas being studied was collected prior to 1967. Gaza was included in Egyptian statistics and the West Bank in Jordan. The time series compiled by the Israeli Central Bureau of Statistics (CBS) over the past ten years are used by all students of the West Bank and Gaza economies, not because their accuracy is known to be high, but because there are no others. One Israeli author who is a major source of economic information on the Occupied Territories and who has attempted to examine macroeconomic patterns and has had the opportunity to question primary sources of the data they report, cautions his readers to regard the following types of data skeptically: trade in goods and services between Israel and the Territories; the product originating in industry, construction and the services sectors; wages in the Territories and in Israel; changes in inventories; private capital movements to and from the Territories; and residually calculated factors including disposable income and savings.^{2/}

Even using the same data source, Israelis, Arabs and "dispassionate observers" have been able to come to very different

^{2/}Bregman, A., The Economy of the Administered Areas, 1974-1975

conclusions. This is partly attributable to the political lenses through which they look at the world. The ambiguity of the data in some cases also facilitates wildly different interpretations. Therefore, an attempt has been made in this analysis to consider only clearly discernible trends and to avoid judgments which require precise measurements. It should be kept in mind that all data on the Occupied Territories exclude the population and economic activity of Israeli settlements, which are treated by the Government of Israel as Israeli territory for the purpose of describing economic activity. The annexed areas of Jerusalem are also excluded.

III. Macroeconomic Situation

A. The Land

Gaza and the West Bank combined have a total land area of approximately 2,600 square miles, roughly half the size of the State of Connecticut. Of the total area, Gaza is only approximately 150 square miles in size.

Gaza is a low-lying strip of Mediterranean coast which in earlier days was sparsely populated. The population rose dramatically as a result of Israel's 1948 war of independence, when large numbers of Palestinian Arabs fled to the area, which was then under Egyptian control. The Strip is approximately 25 miles long with an average width of six miles. Nearly two-thirds of Gaza's area is under cultivation and about half of that is irrigated. The water comes from wells which tap the aquifer layers on which the oasis feeds. Most of the uncultivated land area is used as living space for people - the largest being Gaza City. The average rainfall is about 14 inches.

The West Bank has several distinct topographical zones in its nearly 2,500 square miles. The northern tip is an extension of the Jezreel Valley, which is located primarily in Israel. The northwestern portion nearest the sea rises gently from the Plain of Sharon. The highlands run through the central portion of the West Bank area on a north/south axis. To the east of the highlands there is a sharp drop from about 2,500 feet altitude to more than 1,000 feet below sea level in the Dead Sea area. Rainfall is heaviest in the northern tip and the Sharon Plains region, about 30 inches a year. It diminishes sharply from north to south and from the west to the east. Between the mountains and the Jordan River/Dead Sea is the Jordan Valley, where rainfall is negligible.

The soil in the flatlands area and in the valleys of the

region north of Jerusalem is reasonably fertile. The hillsides are extensively cultivated with olive and fruit orchards on terraces which go back to the Roman era. In the Judean hills south of Jerusalem, the soil is of poorer quality and much of it is unsuitable for agriculture even when water is available. Nevertheless, the valleys and the terraced hillsides of the south highlands area are one of history's most famous wine and table grape growing areas. The grape is to the south what the olive is to the north.

The Jordan Valley and the strip along the Dead Sea are hot and very dry. Some of the land is saline and completely barren. Other land, however, is of fairly good quality and can be quite productive when water is applied.

B. The People and the Labor Force

Israeli sources place the population of the West Bank and Gaza at 1,122,600 in 1977. Of that number, 681,200 people live in the West Bank and 441,400 in Gaza and Northern Sinai.^{3/} Included in the above figures are an estimated 310,000 refugees,^{4/} 240,000 of whom still live in camps. Of the 105,000 refugees in the West Bank, 65,000 are in camps; in Gaza 175,000 of the 205,000 refugees (nearly half the population) are in camps. There are 19 refugee camps in the West Bank and eight in the Gaza Strip.

The population distribution in the West Bank is as different from that of Gaza as is the topography of the two areas. In the West Bank most of the people are concentrated on the slopes of the central mountain range. Half the population is rural, living in 450 villages containing 50,000 families. The northern part of the West Bank is more heavily populated than is the area south of Jerusalem. The main towns are Jenin, Nablus, Tulkarm and Ramallah (north of Jerusalem) and Bethlehem and Hebron (south of Jerusalem). There are very few people in the Jordan River Valley with the exception of the area around Jericho. The population of the West Bank was estimated at approximately 900,000 in 1967 before the June war.

As previously described, Gaza is heavily populated. The towns of Gaza, Khan Yunis and Rafiah form an almost continuous urban band.

^{3/}Northern Sinai is included to account for a few thousand Bedouin who wander in and out of Gaza. It does not include Israeli settlements in Sinai.

^{4/}A refugee is defined here as any person living in the Occupied Territories, the head of whose family lived in the territory of Israel before 1948

The land which is not lived on is farmed, the exception being a dune area between the beach and the beginning of the citrus groves about a half a mile inland.

The people in both areas tend to be young. Forty-seven percent of the population of Gaza and 46 percent of that of the West Bank are 14 years of age or under. The median age is 16.1 years. The rate of natural population increase for the total area is approximately 3.2 percent. This is composed of a 3.1 percent rate of increase in the West Bank and a 3.6 percent rate in Gaza, using 1977 data. However, because of out-migration, the population growth rate is usually smaller. The population of the total area grew by slightly over 2 percent in 1977 -- 1.5 percent in the West Bank and 2.9 percent in Gaza and Northern Sinai.

Because of the relative youth of the population, less than 50 percent are of working age (15-64 years). For the area as a whole, the working age population totals 550,000; 333,000 are in the West Bank and 217,000 in Gaza. The number of people actually employed is much smaller. Only 205,000 people out of the 550,000 potential workers living in the Occupied Territories have jobs. This is only 37 percent of the working age population.

The relatively low labor participation rate is related to the fact that fewer than 15 percent of the women in the working age population have jobs. This is essentially a culturally dictated phenomenon linked to traditional Arab restrictions on women's activities. It is changing only slowly.^{5/} Underemployment, usually in agriculture, is also declining as other job opportunities expand.

Of the 205,000 Gazans and West Bankers employed, approximately 63,000 work in Israel, usually commuting each day.^{6/} Of those West Bankers with jobs, 92,000 work locally and 35,500 in Israel, for a total of 127,400. In Gaza the numbers

^{5/}There is a striking difference in terms of participation in the labor force by women between the West Bank on the one hand and Gaza on the other. Approximately 19 percent of working age women in the West Bank are employed. The corresponding figure for Gaza is four percent.

^{6/}It is estimated that over 30,000 Arab Palestinians work in Jordan and the Gulf States. They are not included in these statistics.

are 50,000 working locally and 27,500 in Israel, for a total of 77,300 employed. Stated another way, nearly one of every three employed persons living in the West Bank and Gaza works in Israel. This has created a strong and, to some people, troubling economic interdependence between the economies.

Table 3 gives a breakout of employment in the West Bank and Gaza by types of activity. Nearly a fourth of the total work force is in agriculture, 15 percent in industry, 21 percent in construction, 15 percent in public and community services and the remaining 26 percent in trade, transport and other services. Of those who work in Israel, 45 percent are in the construction trade, 21 percent in industry and 16 percent in agriculture. In Gaza, 56 percent of the total population which is employed locally works in public or private services.

There is virtually no unemployment in either the West Bank or Gaza. In 1977 the overall unemployment rate was 0.7 percent, composed of 1.1 percent in the West Bank and 0.1 percent in Gaza -- all of it frictional unemployment. The low rate is largely explained by the willingness of those who want to work to take whatever jobs are available, even if this means switching to a new type of activity. The remarkably low unemployment rate has persisted in recent years in the face of a recession in the Israeli economy.

Although the number of West Bankers and Gazans employed in Israel has dropped off somewhat from the high of around 70,000 which was reached in 1975, those who lost their jobs in Israel were able to find new ones, due in the main to the construction boom going on in the West Bank and Gaza. There is presently a labor shortage in the Occupied Territories, as verified by the statements of Arab employers and the fact that the graduates of the vocational training centers are all placed easily.

Some Gazans and West Bankers look upon the export of workers to Israel as a negative economic factor as well as the cause of social problems. In economic terms, the Occupied Territories are almost certainly better off having workers go to Israel than if these people stayed to work in their own localities. The social costs probably are not particularly high because nearly all such workers return to their homes each night. This is not true of the thousands of Gazans and West Bankers who have jobs in Jordan and the Arab oil states. These people, who tend to be more highly skilled than those who work in Israel, leave their families in the Occupied Territories for months or years at a time. Their remittances add substantially to the economic welfare of the area, but there are, no doubt social costs to this arrangement. The workers themselves

clearly think that the benefits outweigh the costs and their employment has taken on an increasingly permanent character according to data from the labor exchanges.

C. Gross National Product and Gross Domestic Product

Tables 4, 5 and 6 give details of the Gross National Product (GNP) of the West Bank and Gaza by factor cost, by sector and by resources and uses. The data lead to the following conclusions:

1. Growth in real GNP in both areas since 1968 has been most impressive, about 12 percent a year on the average. However, the rate has slowed down, perhaps to 6 percent since 1974.
2. The major forces behind this high growth rate have been increases in factor payments from abroad (mainly worker remittances from Israel and Arab countries), a construction boom and, until recently, advances in agricultural output. Industrial growth has been somewhat slower than growth in overall GNP.
3. The service sector has been decreasing in relative importance as GNP has grown.
4. Gross Domestic Product (GDP) growth, while slower than the increases in GNP, has also been rapid.
5. Per capita GNP in the West Bank is now approximately \$900. This is comparable to that of East Bank Jordan.
6. Per capita GNP in Gaza is about 70 percent of that of the West Bank.
7. Despite moderate savings rates, investment has been fairly low, and most of that has been concentrated in housing.

The strong dependence of the Occupied Territories on remittances from abroad is very troublesome to West Bank and Gaza leaders. According to Israeli figures, net factor income from abroad averaged \$227 million for the Occupied Territories in 1976-77. This figure probably is an understatement of the actual situation. In fact, no reliable data exist on remittances to the Occupied Territories except from Israel; nor is there any official estimate of how many West Bankers and Gazans work abroad (other than in Israel). Remittances are made through a labyrinth

of unofficial channels and family connections which makes accurate record keeping impossible.

D. The Balance of Payments and Foreign Trade

Tables 7 and 8 on the balance of payments and foreign trade reveal the following patterns:

1. The Occupied Territories are heavily dependent on foreign trade.
2. Both Gaza and the West Bank have large merchandise deficits in their balance of payments. These are financed by exports of personal services (workers in Israel), remittances from workers in other countries and transfers from abroad.
3. The economies of both areas are very closely tied to Israel. The combined areas receive 91 percent of their imports from Israel and send it 61 percent of their exports. Only one percent of imports come from Jordan and 34 percent of exports are sent there, including those which are transshipped to other areas.
4. Eighty-two percent of total imports and 57 percent of exports are industrial goods. The industrial exports are mainly products which are manufactured under sub-contract to Israeli firms and destined for the food, textile and building materials sectors.
5. Gaza's exports other than to Israel are mainly citrus, and the West Bank's agricultural exports to Jordan mostly olive oil and semana, a product similar to butter oil.

E. The Monetary Situation, Finance, and Savings and Investment

There is no conscious monetary policy in the Occupied Territories. Approximately 90 percent of the means of exchange is currency in circulation. In the West Bank both Israeli currency and the Jordanian dinar are legal tender. In Gaza only the Israeli pound is legal tender but residents have free access to foreign currency and gold. The Arab population in both areas chooses to keep only minimum balances in Israeli pounds. Substantial savings are kept in Jordan and elsewhere. A large but unquantified portion is held in cash or specie by individuals who use these assets to supplement consumption when income drops

temporarily and as emergency reserves. The high liquidity preference stems from a combination of political uncertainty and cultural factors.

Only Israeli banks operate in Gaza and the West Bank. Their role in the economy is quite limited - their credit and deposit facilities being used primarily by Israelis. There is, however, an extensive network of West Bank money changers which performs a variety of semi-banking functions, such as transferring balances between local residents and overseas. Thus, the money supply can expand and contract significantly for no apparent reason. The Government of Israel has chosen not to impose restrictions on this practice, although it is exploring the possibility of allowing Arab banks to operate in the occupied areas.

Under these conditions, only part of the savings of West Bankers and Gazans are transformed into productive investment in the Occupied Territories. The result is a lower level of economic activity than would otherwise be possible. Most observers agree that considerable time and favorable investment conditions will be needed before these deeply ingrained habits change. In the meanwhile, most of the risk capital for productive enterprises will have to come from external sources.

Government of Israel data show that the inflation rate in the Occupied Territories closely follows that of the Israeli economy. This is not surprising considering the close integration of the three areas. It is, however, misleading so far as the West Bank is concerned. All Government of Israel price data are in Israeli pounds. Actual transactions in the West Bank are frequently in Jordanian dinars. Dinar prices have risen quite slowly in recent years. Therefore, the perceived inflation rate for West Bankers is much less than the data suggest. In Gaza, the data reflect the actual case more closely.

F. The Infrastructure

During the years immediately following 1967, the Government of Israel devoted some of its own resources to improving West Bank and Gaza infrastructure in transportation, communications, electricity and municipal water supplies. In recent years, such projects have been financed primarily with local funds. The tax structures in the Occupied Territories have been left more or less in their pre-1967 forms. While services in the Territories are still less developed than in Israel, they have shown steady improvement in a number of areas. Roads are generally good and fully integrated into the Israeli network. Municipal

water systems are frequently inadequate during the dry season, but are getting better. Electricity has been extended to many new areas by local cooperative efforts and some West Bank towns have been connected to the Israeli grid, as has all of Gaza. The telephone systems are antiquated and entirely inadequate, however. There are no railroads nor airlines.

The absence of any modern port facilities in the Occupied Territories has given rise to speculation about possible arrangements should peace be achieved. Four possibilities exist: use of Israeli ports; use of Aqaba; construction of a port in Gaza; and some combination of the above. In purely economic terms, use of Israeli ports is probably preferable. Haifa can easily handle cargos destined for the northern portion of the West Bank, and Ashdod could serve Gaza and the southern West Bank area. Transportation from Aqaba to the Occupied Territories is quite expensive. Construction of a port in Gaza would also require significant capital expenditures.

IV. The Microeconomic Situation

A. Agriculture

Agriculture is the economic mainstay of both the West Bank and Gaza. In the West Bank, 34 percent of employment and 31 percent of the GDP was generated in the agricultural sector in the 1976-77 period. The comparable numbers in Gaza were 26 percent of employment and 33 percent of GDP. It is necessary to do these calculations on an average year basis because, particularly in the West Bank, agricultural activity has wide variations, depending on rainfall. It should be noted that agriculture also provides much of the basis for such industry as exists in both areas.

There are slightly over 2.2 million dunams^{7/} of land cultivated in the West Bank and Gaza. Two million of these are in the West Bank, of which only 80 to 90 thousand are irrigated. In Gaza about 95,000 dunams are irrigated -- nearly half the total cultivated land in the Strip. This disparity in the use of irrigation reflects the almost totally different kinds of agriculture pursued in the two areas.

In the West Bank a large part of the cultivated area is planted on the terraced hillsides and in the valleys. In the area between Ramallah and the northern border of the West Bank,

^{7/}One dunam equals approximately one-fourth acre or one-

an estimated 600,000 dunams are planted in olive trees alone. In the south, the grape is king. Because almost 95 percent of the area is dry farmed, yields vary widely from one year to the next depending on rainfall. Most of the 80,000 to 90,000 dunams of irrigated land use the inefficient flood irrigation system with wells as their water source. With the exception of a small area around Jericho, almost the entire irrigated area is in the northern valleys and western slopes. The estimated annual water use for agriculture is 70 million cubic meters in the West Bank area.

The West Bank produces wheat, potatoes, a large variety of vegetables, citrus, livestock, poultry, olives, grapes and other fruits. It is a net importer of all of these food items with the exception of vegetables and fats and oils (olive oil). Fruit and olives usually account for about one-third of the value of agricultural output but can rise to 50 percent in an exceptional year when the biennial olive cycle coincides with good weather.

Livestock and their products contribute approximately one-third of the value of total agricultural production. Livestock in the West Bank, primarily sheep and goats, numbered approximately 500,000 head in 1975. There are also cattle, donkeys, horses and a few camels. Sheep produce 45 percent of the total meat output. Because of the destructive grazing characteristics of the goats, a conscious effort by the West Bank military government has been made in the last few years to reduce the number on the land. Another program has been adopted which encourages farmers to fatten lambs to a heavier marketing weight than has previously been their custom, with the idea that the total meat deficit, which amounts to approximately 2,700 tons annually, can be closed. This would also raise the return per animal to growers.

Most West Bank farms are small. Approximately 65 percent of all farms have between 10 and 40 dunams. On the other hand, 10 percent of all farms cultivated have 100 dunams or more. Because of the large sizes of these farms, they include half the cultivated land in the West Bank. They are frequently owned by absentee landlords and are worked under sharecropping arrangements. Titles to these large tracts are usually clear as contrasted to the situation in smaller holdings. Because sharecroppers' tenancy is of very unsure duration, there is little incentive for them to make improvements in the land they work.

Another problem is the practice of splitting landholdings equally among male heirs. This means that many plots now

must be farmed cooperatively if they are to support even one family.

Since 1968 there has apparently been rapid growth in agricultural output in the West Bank. It would appear that the average rate of increase has been in the neighborhood of 6 percent a year in real terms, but it must be emphasized that this is a crude approximation. Output per farm worker and crop yields have probably increased. Agriculture has become increasingly mechanized, and the use of inputs such as fertilizer, herbicides and improved seeds is growing. The use of plastic covers for winter crops is increasingly visible in the West Bank area. There are currently some 7,500 dunams on West Bank farms devoted to this activity. Mainly they produce winter vegetables, some for local consumption and some for export. This plastic cover farming is mainly in the western slope area and the lowlands on the edges of the Plain of Sharon.

One effect of the changes in agriculture has been to free labor from the land and make it available for other uses. Many of those working in Israel come from farms.

There is some room for future advances in West Bank agriculture, but it is unlikely that there will be any dramatic breakthroughs. Most good land is already under cultivation. With improved technology, output from this area can be increased and some marginal land brought under cultivation. Water is the second important limiting factor. Much more efficient use can be made of the water resources by utilizing better irrigation methods and capturing and storing surface water. Extending irrigation to areas in which it is not presently available would also increase output. However, this involves expensive and time consuming investment. Moreover, availability of water limits the area which could be irrigated.

Even assuming continued improvement in technology and some expansion in areas which are irrigated, the number of people who can be usefully employed in agriculture will probably remain constant or continue to shrink in the years ahead. Thus, although agriculture will remain very important to the West Bank economy, it cannot be relied upon as a major engine of employment growth.

Agriculture in the Gaza Strip is much less diverse but no less important to the economy than it is in the West Bank. As previously mentioned, of the 370,000 dunams in the Gaza land area, approximately 210,000 dunams are under cultivation, of which nearly half are irrigated. Slightly over 70,000 dunams of the irrigated land are in citrus production and the remainder in

vegetables. Of the total land area devoted to agriculture, 60 percent is calculated to be in annual crops and 40 percent in perennial crops. The latter category is mainly citrus fruits. Production from the citrus orchards accounts for slightly more than one-half of Gaza's total agricultural output. There are approximately 19,000 farms in Gaza. Roughly half of these employ hired labor and the other half are family operated.

In the period 1968 to 1974, Israeli calculations are that agricultural output in Gaza has grown 1.8 times in real terms, or approximately 10 percent per annum. Application of Israeli technology has apparently brought about substantial progress toward making optimum use of inputs. However, a considerable portion of the growth is related to the maturing of citrus orchards planted before 1967. At the time of the 1967 war, over 50 percent of the area planted to citrus was not yet producing fruit.

Gaza is probably near the limit of its agricultural output using present production techniques. The main limiting factor is water. Until recently, Gaza citrus and vegetable farmers were allowed to sink wells almost without restrictions. The water from the wells was used in canals and ditches for flood irrigation, a method which is far less efficient than the sprinkler and drip systems used in Israel. A point has now been reached where more water is being pumped out of the Gaza water table than is put into it each year. The result has been salt water encroachment from the sea, particularly in the southern end of the Strip. Unless arrested by effective water management, the salt water encroachment eventually will destroy a large part of Gaza's agriculture, and with it Gaza's prosperity. Israeli authorities are now taking some unpopular measures to cut back on water usage. Gauges have been put on pumps to limit consumption and a grant/loan incentive program has been started to encourage conversion to drip or sprinkler systems. Meanwhile, damage is increasingly visible in the yellowish citrus foliage which can be seen in the affected areas.^{8/}

In the short and medium term, the best hope for the expansion of Gazan agriculture is in the newly developed

^{8/}It should be emphasized that we know very little about the availability of groundwater in Gaza. It is possible that Gaza is using water resources which will be very difficult and expensive to replace.

"mawan" method of farming. In the coastal areas bulldozers have scraped away the sand dunes to create 4,000 dunams of truck gardens sitting just on top of the water table. With the application of fertilizer, bumper crops of vegetables and strawberries are produced without irrigation. Since the aquifer used is separate from that supplying the irrigation wells, there is no trade-off in water terms.

Arabs and Israelis agree that part of the credit for the sharp increase in farm income and production in agriculture is the availability of a highly competent and well motivated extension service. Most of the extension agents are native West Bankers or Gazans, but the selective use of highly qualified Israeli experts in teaching and supervisory positions has also been helpful. In the years shortly after the 1967 war, the Government of Israel, as a matter of policy, made easy credit available to Arab farmers as a means of providing incentives to purchase tractors and other modern farm implements. Notwithstanding the above, everyone agrees that the main factor in agricultural modernization is the farmer himself, who has proven to be adaptable, hard-working and intelligent.

Some West Bankers claim that the progress which has been made in agriculture cannot be attributed to Israeli help. They argue that the process of modernizing technology had begun long before the Israeli occupation and was essentially indigenous in nature. As proof, they point to the modern agriculture being pursued on the East Bank of the Jordan today -- including drip irrigation and plastic cover farming. They reject the Israeli contention that the demonstration effect of exposure to modern agricultural methods has been to transport the technology from Israel to the West Bank and subsequently into the East Bank.

This controversy is indicative of the gap in perceptions between the Israeli authorities and the Arabs in the Occupied Territories. Israeli military authorities, and indeed the Israeli public, believe that their administration of the West Bank has been essentially benevolent. The Arabs are loath to admit that anything good has come from the occupation, even by accident. They argue things would have been better yet if there had been no occupation at all.

B. Industry

It doesn't take long to describe West Bank and Gaza industry because there is not very much of it. What there is is mostly small workshop type production. In 1972 only five factories in the West Bank and Gaza employed more than 100 people. The number probably is not appreciably higher today. The two main

growth sectors of industrial output have been created since 1967: production units which supply components for Israeli plants on sub-contract; and those which process raw materials and agricultural products for sale in the Occupied Territories and for export. In the northern part of the West Bank, industries linked to the processing of olives (oil pressing, soap manufacturing) are of major importance. In the south, building stone quarrying and finishing are among the principal activities. Other important industrial products are cigarettes, plastics, chocolate candy, pharmaceuticals, shoes and clothing. Most Gaza industry is located in the Erez development at the border of the Strip with Israel. There, mainly Israeli investors have set up small plants for the production of components for their operations in Israel or, in a few cases, for carrying out the entire manufacturing operation. Except for the citrus and vegetable processing plants, the other manufacturing operations in Gaza are of the handicraft variety. In the West Bank and Gaza, Israeli clothing makers send pieces into individual homes for sewing and hand finishing.

As noted elsewhere, industry accounts for 15 percent of the total employment in the Occupied Territories -- 15 percent in the West Bank and 13 percent in Gaza. On the other hand, it produces only 6 percent of GDP in the West Bank and 10 percent in Gaza, well below the percentage of the labor forces which it employs. This suggests rather low levels of capitalization. Nevertheless, labor productivity has been increasing fairly rapidly.

The most rapidly expanding area of manufacturing may be in construction materials. As mentioned elsewhere, there has been a building boom in the West Bank and Gaza in recent years and there is a growing demand for a wide range of building materials: tiles, bricks, dressed stones and hundreds of other minor construction items. These operations can be established with relatively low capital inputs and on a small scale.

Growth in industrial output has proceeded at a rapid rate in Gaza (see Table 5). This is a bit deceiving, however, since the level of output from which growth rates were calculated is very low. On the other hand, in the West Bank, growth in industrial output has lagged behind the rate of expansion of the economy as a whole. The main obstacles that will have to be overcome if the rate of industrial expansion is to accelerate are a shortage of entrepreneurial experience, insufficient infrastructure to support rapid industrialization and a reluctance on the part of potential investors to commit capital to productive ventures in the Territories during a period of political uncertainty. Domestic private savings rates are modest, averaging

about 15 percent of disposable income in the West Bank and 22 percent in Gaza for the period 1968 through 1977. Some is hoarded or held in banks outside the Territories. Of that which is invested domestically, a large proportion goes into real estate (particularly in the West Bank) rather than industrial (or agricultural) ventures.

In the West Bank, there is some potential for further development of industry to process agricultural output. Thus, the transition of agriculture toward industrial crops could facilitate the development of a preserves industry. There has been a major shift toward producing crops for canning. However, the Israeli canning industry will have an important competitive advantage over any fledgling canning industry developed in the West Bank. There is also the possibility for expansion in the dairy industry, but again it would be faced with a highly protected market in Israel.

Other industrial areas which might be further developed include building stone, pharmaceuticals and furniture. However, it is unlikely that expansion in these fields will result in establishment of large factories.

Concerted efforts need to be made to identify those areas in which West Bank products may have a comparative advantage over highly competitive or protected Israeli products. The potential should also be examined for expansion of exports of some West Bank products that might have a competitive advantage in the Arab world, including chocolate and vegetable oil.

A solid infrastructure for modernization of the industrial sector is necessary. This involves investments in utilities, communications and basic services such as banking, education and training. The creation of this infrastructure is costly and must, of necessity, be carried out with heavy government involvement.

Future growth prospects for industry in the Gaza Strip are constrained by factors similar to those described for the West Bank:

1. Limited availability of risk capital.
2. Lack of entrepreneurial experience.
3. Limited infrastructure for industry.
4. Need to identify products which can compete in Israeli and Arab markets.

In the short run (say the next five years), it is unlikely that Gaza will be able to make sufficient inroads toward resolution of these constraints to sustain the rapid rate of growth (from a very low base) achieved in recent years.

C. Education

Palestinian Arabs are proud of their reputation as being the best educated Arabs in the region. In general, schools have been left under local autonomy with the Jordanian curriculum still in use in the West Bank and the Egyptian system in Gaza. Existing higher education facilities have been expanded in the West Bank in recent years and a new college established in Nablus. There is no college or university in Gaza. Students from both areas who want to pursue specialized training must go abroad to do so - a serious impediment to all but a privileged few. As indicated by the large number of educated Palestinians working in Jordan and the Arab oil states and the continuing demand for new graduates, the West Bank and Gaza still enjoy their comparative advantage in human capital. That this asset is exported instead of being used locally has economic as well as social costs, however.

1. West Bank

Education on the West Bank is provided by three separate systems -- the public schools under the overall supervision of the military government, UNRWA schools, and private institutions (mainly Christian and those supported by international agencies abroad). The 1964 Jordanian educational laws have remained in force under Israeli occupation and provide for free compulsory education for nine years (six years in primary schools and three years in preparatory schools) beginning at age six, and for free secondary education for three years. Vocational training in technical, agricultural, and commercial skills are incorporated within the framework of the regular high school curriculum.^{9/} Moreover, the government system includes several agricultural and teacher training institutes to provide elements of higher education.

The government schools serve about 76.1 percent of the total student population (over 175,000 pupils as of 1976). While facilities and teaching staff have increased over the past ten years, so too has student enrollment. The average number of students per class (33.7) and the average number of students per teacher (27.4) have remained fairly constant since 1967.

^{9/}In addition, the Ministry of Labor and UNRWA conduct specialized vocational training for senior workers, high school graduates and school dropouts.

UNRWA schools provide educational services to the refugees. The first nine years of education are compulsory.^{10/} These schools serve 14.8 percent of the student population (over 34,000 pupils as of 1976). As with the government schools, student/class (averaging 35.1) and student/teacher (averaging 30.6) ratios have remained fairly constant.

The private schools are located primarily in the Bethlehem and Ramallah regions. They serve approximately 9.5 percent of the student population (over 21,000 pupils as of 1976).

For primary and preparatory schooling, the proportion of the school age population actually attending school has increased from 80 percent in 1969-70 to 96 percent in 1975-76. Expansion of physical facilities has apparently not kept pace with growing student enrollment as evidenced by increased double shifting. As for noncompulsory secondary schooling, a fairly constant 25 to 27 percent of the relevant population chooses to attend.

2. Gaza Strip and North Sinai

As is true in the West Bank, education in the Gaza Strip and North Sinai is offered by three major providers -- the government, UNRWA and private organizations. As of 1976-77, the UNRWA schools served 57.8 percent of the student population (71,888 pupils), government schools served 38.9 percent (48,266 pupils) and private schools served 3.3 percent (4,180 pupils). These proportions have remained fairly constant since 1968.

On the average, there are 41.7 students per class in government schools in the Gaza Strip, which is 8 students per class more than in the West Bank. The student/teacher ratio is also substantially higher. These higher student densities are due, in part, to a chronic shortage of teachers brought on by the departure of Egyptian staff after 1967.

At primary and preparatory levels, the percentage of school age children attending school has risen dramatically, from a low of 46.6 percent in 1967-68 to 94.9 percent in 1975-76. In part, this increase can be viewed as a function of the establishment of compulsory education by the military authority in 1971. The percentage of school age persons actually attending secondary (noncompulsory) schools is much lower, but has increased over the past ten years.

^{10/}Secondary education for refugee children is provided by the government system, although UNRWA has established one vocational high school and several teacher training units.

Are facilities adequate to meet the demands for education? Statistics on the UNRWA schools in the Gaza Strip indicate an increasing percentage of double shifting, amounting to 48.4 percent of all classes in 1975-76. Although figures are not available, government-run schools are also believed to have a high proportion of double shifted classes, but not to the same degree that UNRWA experiences. Moreover, class crowding and large teacher loads lead to the conclusion that education facilities in the Gaza Strip are inadequate.

D. Health Services

The paragraphs which follow describe in summary fashion the health care "establishment" -- facilities, staff, institutions -- in the Occupied Territories. On the other hand, there is very little discussion of the health status of the population, even though in our judgment this is a more important topic. Ideally, one would want to describe morbidity patterns and levels, mortality rates and nutritional status by population subgroups, identifying major problem areas and their causes. Only in this way is it possible to determine the adequacy of the health services available. Unfortunately, we do not yet have the information necessary to treat these areas adequately. From conversations with West Bank health personnel, we have the clear impression that infant mortality remains a very serious problem, although there have been improvements in recent years. However, we are not able to estimate the dimensions of this or other health problems within a tolerable range of error.

1. West Bank

There are three providers of health services in the West Bank: the government, UNRWA and private institutions. However, government-run institutions command a predominant share of the facilities, personnel and public usage. Government health care services include nine hospitals, 109 clinics (as of 1973), 27 mother-child centers, three laboratories, three tuberculosis clinics, and various preventive and promotive health services. UNRWA facilities include clinics, mother-child welfare stations, and various disease control and environmental health programs in the refugee camps. UNRWA patients requiring hospitalization are usually referred to government or private facilities, where a number of hospital beds are available for UNRWA referrals.

The number of hospitals in the West Bank has declined by about one-third since the beginning of the Israeli occupation. This is due primarily to Israeli restructuring and redistribution of health care services. Small facilities were closed or

combined with others, with an emphasis on developing comprehensive regional health care centers to serve rural populations. Many of the remaining facilities have been modernized, and specialized hospitals have been built or converted by the government. The number of hospital beds per 1,000 population has remained fairly constant at about two.

All professional medical personnel in the West Bank are Arab. While the number of doctors declined after the 1967 war, the pre-war level was reattained by 1969. As of 1974, 600-800 West Bank students were studying medicine abroad and may serve to increase the number of qualified medical personnel in the future. Maldistribution of physicians in Jenin and Hebron appears to have been corrected, and the total number of doctors in the West Bank has reached about 200 (in government and non-government facilities). This amounts to about three physicians per 10,000 population (in 1973).

Annual health services expenditures by the government have increased since 1969. The per capita allocation also increased by about two-thirds to a level of about \$9.67 in 1972-73 (1976 dollars).

According to two observers (Pielemeier, 1975; Stebbing, 1977)^{11/}, the health status of the population has improved rapidly in recent years. The health care structure is modern and likely to be sufficient for a period of years, providing that existing institutions can keep pace with developing needs, population increases do not accelerate, and Israeli services remain available. Death rates have declined overall. UNRWA and government disease control, immunization, and environmental health programs have reduced the incidence of disease.

Many problems remain. There is a critical shortage of qualified nursing personnel, which was highlighted in a special World Health Organization report on the West Bank (Pielemeier, 1975). Planning and cooperation among health care providers is lacking. In addition, limited post-graduate medical education in the West Bank slows trends toward modernization of techniques and skills.

^{11/1}. Pielemeier, N., "The Health Situation in the West Bank and Gaza Strip - North Sinai: A Background Paper." Washington, D.C.: Department of Health, Education and Welfare, Office of International Health, October 1975.

2. Stebbing, J., The Creation of a Palestinian Arab State as Part of a Middle East Settlement, 1977 (mimeo).

2. Gaza Strip and North Sinai

The government and UNRWA provide the majority of health care services in Gaza. Only one private hospital is maintained. The government runs six hospitals with a total of 995 beds (as of 1977) and 18 clinics (as of 1973). UNRWA conducts comprehensive preventive, curative, and rehabilitative services in nine clinics in the refugee camps and can refer patients to 659 beds available in the government and private hospitals. A tuberculosis hospital is jointly administered by the government and UNRWA. All government health services were provided free to Gaza Strip residents as of 1973 (Pielemeier, 1975).

While the number of hospital beds per 1,000 residents has kept pace with population increases, new hospital facilities have not been constructed; additional beds have been moved into existing hospitals. There was a severe shortage of doctors and nurses between 1967 and 1973. Israeli medical staff were called upon to fill many of the health care posts left vacant when the entire Egyptian staff returned to Egypt in 1967. As of 1974, there were 2.9 government doctors and 7.6 nurses per 10,000 persons. More recently, there has been a gradual return of medical school graduates to the Gaza Strip from Arab universities. Israeli hospitals have also provided advanced training to Gazan doctors.

Are health services in Gaza satisfactory? Major communicable diseases, infant mortality, and death rates have been reduced. An increased percentage of births are occurring in hospitals. On the other hand, while standards of hygiene and sanitation have been maintained, they are still at low levels (Pielemeier, 1975; Stebbing, 1977). Overall, medical staff supply has not kept up with demand. Clinics and hospitals are overcrowded and professional personnel is insufficient, although there has been improvement in staffing levels.

TABLE

Basic Economic Data on West Bank and Gaza
(1977 Unless Otherwise Indicated)

	<u>Total Areas</u>	<u>West Bank</u>	<u>Gaza and Northern Sinai</u>
1. Population	1,122,600	681,200	441,400
2. Working Age Population	550,500	333,200	217,300
3. Employed in the Areas	141,800	91,900	49,900
4. Employed in Israel	62,900	35,500	27,400
5. Total Employed	204,700	127,400	77,300
6. Unemployment Rate	0.7%	1.1%	0.1%
7. Rate of Natural Population Increase	3.2%	3.1%	3.6%
8. Rate of Population Growth	2.0%	1.5%	2.9%
9. GNP (millions of dollars)	909	617	291
10. GNP per Capita (dollars)	790	905	668
11. Exports (millions of dollars)	508	287	221
12. Imports (millions of dollars)	633	356	277
13. Import Surplus (millions of dollars)	125	69	56
14. Total Resources (millions of dollars)	1,027	688	338
15. Annual GNP Growth (1968-69 to 1976-77)	12.0%	11.0%	12.0%
16. Annual Average GDP Growth (1968-69 to 1976-77)	8.0%		

TABLE 2

	<u>Land and Its Uses</u> (in dunams) ^{1/}		
	<u>Occupied Areas</u>	<u>West Bank</u>	<u>Gaza</u>
Land Area	6,370,000	6,000,000	370,000
Cultivated	2,210,000	2,000,000	210,000
Irrigated	175,000	80,000	95,000
Population Density (population per square mile)	443	290	3,000

^{1/}One dunam equals 1,000 square meters, approximately 1/4 acre or 1/10 hectare.

TABLE 3

Employment of West Bank and Gaza Labor in the
Occupied Areas and Israel
(in percentages in 1977)

	<u>Total</u>	<u>West Bank</u>	<u>Gaza</u>	<u>Israel</u>
Agriculture	23	33	25	16
Industry	15	15	13	21
Construction	21	10	7	45
Public & Community Services	15)))
Trade, Transport & Other Services	26)41)56)17

TABLE 4

GNP by Sector, 1976-77 Average
(in percentages)

	<u>West Bank</u>	<u>Gaza</u>	<u>Total Occupied Areas</u>
Agriculture	31	33	-
Industry	6	10	-
Construction	15	17	-
Public and Community Services	11	18	-
Commerce, Transport and Other Services	37	21	-
Total Domestic Product	<u>100</u>	<u>100</u>	
Domestic Product	<u>77</u>	<u>72</u>	75
Factor Income from Abroad (Net)	23	28	25
GNP	<u>100</u>	<u>100</u>	<u>100</u>

TABLE 5

Gross National Product at Factor Cost
By Economic Sector, 1968-77
(\$ million, at 1974 prices)

	Average			Percent Average Annual Change		
	1968-69	1972-73	1976-77	1968-69 to 1976-77	1968-69 to 1972-73	1972-73 to 1976-77
<u>West Bank</u>						
Agriculture	78	113	124	6	10	2
Industry	17	36	26	5	11	-6
Construction	9	31	59	27	35	18
Public and Community Services	35	45	44	3	7	0
Commerce, Transport and Other Services ^{1/}	64	102	146	13	12	9
Gross Domestic Product	<u>203</u>	<u>317</u>	<u>399</u>	<u>9</u>	<u>12</u>	<u>6</u>
Factor Income From Abroad	21	103	128	24	48	6
Less: Factor Payments Abroad	4	4	3	-	-	-6
GNP (At Factor Cost)	<u>220</u>	<u>416</u>	<u>524</u>	<u>11</u>	<u>17</u>	<u>6</u>

Table 5 Continued on Next Page

^{1/}Includes errors and omissions

TABLE 5 - Continued

	Average			Percent Average Annual Change		
	1968-69	1972-73	1976-77	1968-69 to 1976-77	1968-69 to 1972-73	1972-73 to 1976-77
<u>Gaza Strip</u>						
Agriculture	21	36	57	13	15	12
Industry	3	9	18	22	27	19
Construction	5	18	30	22	41	14
Public and Community Services	21	32	32	5	11	0
Commerce, Transport and Other Services ^{1/}	45	46	36	- 2	-	- 5
Gross Domestic Product	<u>95</u>	<u>141</u>	<u>173</u>	<u>8</u>	<u>11</u>	<u>5</u>
Factor Income From Abroad	4	51	72	44	89	9
Less: Factor Payments Abroad	2	2	2	-	-	-
GNP (At Factor Cost)	<u>97</u>	<u>190</u>	<u>243</u>	<u>12</u>	<u>18</u>	<u>6</u>
<u>Total Occupied Areas</u>						
Gross Domestic Product	<u>298</u>	<u>458</u>	<u>572</u>	<u>8</u>	<u>11</u>	<u>6</u>
Gross National Product	<u>317</u>	<u>606</u>	<u>767</u>	<u>12</u>	<u>17</u>	<u>6</u>

^{1/}Includes errors and omissions.

TABLE 6

Resources and Uses in the Occupied Territories, 1975-77
(in millions of dollars at 1976 prices)

	West Bank					Gaza Strip				
	1975	1976	1977	Percent Quantitative Change		1975	1976	1977	Percent Quantitative Change	
				1976	1977				1976	1977
Private Consumption	446	502	507	7	1	205	206	237	0	15
Public Consumption	47	48	47	1	- 2	27	28	28	3	- 1
Gross Investment <u>a/</u>	85	109	110	28	0	55	63	62	15	- 2
Total Domestic Uses	<u>578</u>	<u>659</u>	<u>664</u>	<u>14</u>	<u>1</u>	<u>287</u>	<u>297</u>	<u>327</u>	<u>3</u>	<u>10</u>
Imports <u>b/</u>	305	336	345	10	3	223	225	266	1	18
Exports <u>c/</u>	245	285	283 <u>d/</u>	16	- 1	164	198	218	21	10
Import Surplus	60	51	62	-15	22	59	27	48	-54	78
Gross National Product (at market prices)	518	608	602 <u>d/</u>	17	- 1 <u>d/</u>	228	266	279	17	5
Total Resources	<u>578</u>	<u>659</u>	<u>664</u>	<u>14</u>	<u>1</u>	<u>287</u>	<u>297</u>	<u>327</u>	<u>3</u>	<u>10</u>

a/Gross investment includes changes in olive oil stocks in the West Bank; changes in investment from year to year are influenced significantly by this factor.

b/Imports include import taxes and factor payments abroad (Israelis working in the occupied areas).

c/Exports include indirect tax rebates to exporters and factor income from abroad.

d/Tentative estimate. Judgmental corrections have been made in the Israeli data series to compute exports.

TABL

Balance of Payments of the Occupied Territories, 1977
(Millions of U.S. Dollars)^{1/}

	<u>Occupied Territories</u>	<u>West Bank</u>	<u>Gaza</u>
<u>IMPORTS</u>	633	356	277
Goods	506	269	237
Services	126	87	39
<u>EXPORTS</u>	508	287	221
Goods	259	125	134
Services	249	162	87
Thereof: Labor (Net)	(222)	(144)	(78)
<u>TRANSFERS (NET)</u>	86	35	51
<u>CAPITAL MOVEMENTS (NET)</u>	40	35	5

^{1/}Not all rows and columns add because of rounding.

TABLE 8

Origin and Composition of Trade of the Occupied Areas, 1977
 (in percentages)1/

	<u>Combined Areas</u>	<u>West Bank</u>	<u>Gaza</u>
Exports to Jordan	34	37	30
Exports to Israel	61	62	60
Exports to ROW <u>2/</u>	5	1	9
Imports from Jordan	1	2	0
Imports from Israel	91	90	93
Imports from ROW <u>2/</u>	8	9	7
Agricultural Exports	43	31	53
Industrial Exports	57	69	47
Agricultural Imports	18	18	18
Industrial Imports	82	82	82

1/Percentages are rounded and do not always add to 100.

2/Rest of the world.