

A.I.D. Technical Report No. 20

Center for Development Information and Evaluation



Capital Projects
Egypt Case Study

AGENCY FOR INTERNATIONAL DEVELOPMENT

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A.I.D. Evaluation Technical Report No. 20

Capital Projects *Egypt Case Study*

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Other papers prepared for the Capital Projects assessment:

**Using Capital Projects to Promote Development
and U.S. Commercial Interests**

Capital Projects: Literature Review and Supplier Survey, (forthcoming), which examines:

- Documents on 68 completed A.I.D. capital projects
- World Bank experience
- Major academic studies
- A survey of U.S. firms that have provided equipment and services for A.I.D.-financed capital projects

Capital Projects: U.S. Aid and Trade in Egypt, Technical Report No. 8, which examines the relationship between U.S. trade and A.I.D.-assisted capital projects in Egypt.

Capital Projects: An Economic and Financial Analysis of Nine A.I.D. Capital Projects in Egypt, Technical Report No. 19.

Capital Projects: A Synthesis of Findings (forthcoming), which focuses on the major findings from the evaluation papers on A.I.D.'s experience with capital projects in Egypt.

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FOREWORD

There is growing interest in some parts of Congress and the Executive Branch to use foreign assistance to advance U.S. commercial interests without jeopardizing the international development objectives of the foreign aid program. Congressional proposals have called for the establishment of a capital projects fund, a mixed credit program, and other trade-related programs.

Many ideas have been put forth as a rationale or justification for capital projects. It is important to closely examine the empirical basis of the many ideas put forth in support of such projects. A first step is to analyze A.I.D.'s past experience. As part of that effort, the Center for Development Information and Evaluation (CDIE) launched an assessment of A.I.D.'s experience with capital projects—experience that spans more than four decades.

The Capital Projects Assessment comprises two parts: First is an examination of the data on World Bank, other donor, and A.I.D. capital project experience. That analysis appears in a forthcoming CDIE Technical Report, *Capital Projects: Literature Review and Supplier Survey*. The second part examines capital projects in Egypt, which represents the largest capital projects program in the A.I.D. portfolio.

A CDIE evaluation team of engineers, economists, and private sector analysts spent more than a month in Egypt analyzing nine A.I.D. capital projects. The team examined project-level impacts on Egypt's economic development and U.S. commercial interests. This report includes the findings from that effort.

This assessment was not designed as an evaluation of A.I.D.'s assistance program in Egypt but to analyze issues raised by A.I.D. management concerning the benefits and drawbacks of capital assistance. The evaluation was structured around questions related to development and U.S. commercial concerns. A.I.D. projects were used as a data base to test those questions.

Another study, entitled *Capital Projects: Economic and Financial Analyses of Nine Capital Projects in Egypt* (Technical Report No. 19) provides a thorough financial and economic rate of return analysis of the same set of capital projects. A separate study, *Capital Projects: U.S. Aid and Trade in Egypt*

(Technical Report No. 8) examines the relationships between U.S. aid and changes in U.S exports to Egypt over the past 15 years.

This report examines the nine A.I.D.-funded capital projects in Egypt over the 1977-1992 period. These projects helped create an infrastructure base that was essential to Egyptian economic development. The projects greatly increased electrical power generation, introduced a modern telephone system in Cairo and Alexandria, and rehabilitated a water and sewage system that served more than 23 million Egyptians. The projects were designed and built to high technical standards, and they provided the basic infrastructure necessary for Egypt's continued economy growth.

Clearly, Egypt received important benefits from the A.I.D. projects. However, data from the economic analysis shows a mixed picture but generally low to medium financial and economic rates of return. The low rates are not due to technical problems—the projects were well designed, used appropriate technology, and were operated in a technically sound manner. In large measure, the poor performance was due to the Egyptian Government's poor economic policies, such as government price controls, regulations, subsidies, and employment and management structures that resulted in inefficient production and inefficient use of project outputs. A clear lesson is that in a bad policy environment even technically sound projects cannot generate a good rate of return.

U.S. firms received export orders from the A.I.D. program since procurement was tied to the United States. However, non-A.I.D. financed, follow-on sales have been very limited. In fact over the 1976-1991 period, total U.S. exports to Egypt have barely equalled total U.S. Government assistance to Egypt. A poor economic policy environment, a continual scarcity of foreign exchange, and an economy dominated by government firms has made it difficult for U.S. and other foreign firms to increase their exports to Egypt.

In the last few years Egypt has initiated several policy reforms that have corrected a number of inappropriate prices and subsidies. These actions, it is hoped, will improve the economic rates of return on capital projects in the future.

SUMMARY

Introduction

This assessment is based on an October 1992 field evaluation that analyzed Agency for International Development's (A.I.D.) experience with capital projects in Egypt. It examines the effectiveness of capital projects in promoting Egypt's economic development, while also promoting U.S. commercial interests.

The analysis is structured around two sets of issues—*commercial benefits* of capital projects for the United States and *developmental benefits for Egypt*. Although the assessment considers each of these dimensions separately, it also evaluates the relationship and trade-offs between them. The analysis of commercial and developmental benefits is structured around seven hypotheses. Some of these issues have been put forward by those who believe that A.I.D. should be launching a much larger capital projects program. These proponents of capital projects argue that capital assistance is critical to third world development, that it is one of the most effective forms of assistance, and that it effectively supports U.S. exports and investment. But there are also those who argue that commercial considerations can distort and misdirect capital projects away from development. Some experts argue that capital projects are good for encouraging policy reforms in a sector, whereas others stress the difficulty of using projects to support sector-level reforms and stress the importance of macroeconomic reforms instead.

No one disagrees that capital projects are sometimes the solution to a particular development bottleneck. The key question is whether a particular capital project is the right instrument in a particular country given that country's specific circumstances.

This evaluation analyzes the commercial and developmental benefits of nine A.I.D. capital projects in Egypt over a 15-year period from 1977 to 1992. The period covers A.I.D. projects from start-up, through implementation and operations, and then after A.I.D. assistance ends. (Seven of the nine projects have been completed, and two are nearing completion.) The period is also long enough to allow analysis of developmental and commercial spin-offs from the projects. These projects provide a representative sample, covering major sectors

of A.I.D. capital assistance in Egypt—electrical power, telecommunications, water, and sewerage. A separate report provides a detailed analysis of the economic and financial benefits of the projects (see Hanrahan et al. 1994).

The Center for Development Information and Evaluation's (CDIE) *Capital Projects* assessments consist of four technical reports:

- *Egypt Case Study*, A.I.D. Technical Report No. 20
- *U.S. Aid and Trade in Egypt*, A.I.D. Technical Report No. 8
- *Economic and Financial Analyses of Nine Capital Projects in Egypt*, A.I.D. Technical Report No. 19
- *Literature Review and Supplier Survey*

Background Studies

Prior to the fieldwork for the Egypt evaluation, CDIE conducted a background study, *Capital Projects: Literature Review and Supplier Survey* (forthcoming), of worldwide experience with capital projects, which includes

- An in-depth analysis of A.I.D. documents (especially midterm and end-of-project evaluations) for a sample of 68 completed A.I.D. capital development projects from 25 countries, with a focus on the impact of U.S.-financed capital projects on development.
- A survey of World Bank and academic literature on capital projects that focuses mainly on the question of the overall impact of capital projects on development.
- A summary of findings from questionnaires sent to major U.S. suppliers of U.S. capital equipment, concentrating on the question of follow-on sales and the effect of A.I.D. procurement contracts on the overall U.S. business presence in A.I.D.-recipient countries.

The *Literature Review and Supplier Survey* yielded a wide body of studies that identified capital infrastructure investments as a necessary prerequisite to economic development. The review of the sample of A.I.D. projects found that in almost all cases, the A.I.D. capital projects were designed to achieve development objectives and only rarely to satisfy political or commercial interests. In two-thirds of the projects, alleviating poverty and meeting basic human needs

(i.e. food, water, shelter, education, and health) were cited as project goals. There was some evidence in completed A.I.D. projects of lower-than-expected rates of return. The study of World Bank experience found a similar problem, with acceptable, but lower than expected, rates of return on capital projects. The World Bank identified policy reform and developing country institutional weaknesses as two areas needing greater attention to make capital project investments more effective in supporting host country economic development.

U.S. suppliers and technical assistance contractors, such as engineering firms, who were interviewed said that they viewed A.I.D. contracts as an important part of their marketing strategy to promote their goods and services overseas. They stressed the strong U.S. commercial benefits (both A.I.D. project sales and follow-on sales) generated by A.I.D.-funded capital projects.

Another background study (Fox 1994) examines the linkage between U.S. capital assistance and U.S. exports to Egypt. The study found that U.S. exports were barely equal to U.S. aid levels and that U.S. assistance did not appear to generate any significant follow-on commercial U.S. exports.

The background studies confirmed the importance of capital projects for development, concluding that a clear relationship exists between infrastructure investments and economic growth. Reliable transportation, power, communications, and water and sanitation facilities are universally viewed as a prerequisite to development. The studies also highlighted the critical importance of a sound policy environment if capital projects are to realize their potential contribution to development. This field study examines issues discussed in the background papers within the Egyptian context, focusing on issues dealing with capital projects and U.S. commercial interests.

The A.I.D. Program in Egypt

In 1978, as a result of the Camp David Accords, Egypt ended its conflict with Israel. With Egypt and Israel at peace, and Egypt no longer an ally of the Soviet Union, the threat of a regional conflict was greatly reduced. It was a time of major change as Egypt turned toward the West—there was an economic liberalization of the Egyptian economy, foreign firms were encouraged to invest in Egypt, the Government officially turned away from Soviet assistance, and Arab and Western support greatly increased. The United States wanted to continue the peace process and was thus very interested in maintaining Egypt's economic and political stability.

The result was a massive U.S. economic assistance program to support Egypt's economic development. The consequent need to spend large amounts of A.I.D. money in Egypt and the need for large investments to rehabilitate and expand Egypt's industry and infrastructure led to a large capital projects program.

Egypt's badly deteriorated infrastructure was perceived as a major constraint, holding back economic productivity and investment. Although a major rebuilding effort was clearly required, it was also evident that new physical investments by themselves would not be sustainable. For the system to become viable Egyptian infrastructure needed a major institutional and management restructuring and a financing and user-fee structure that could generate adequate funds to maintain itself.

Findings

This assessment presents the hypotheses as questions and in examining the benefits of the nine capital projects in Egypt arrives at the following findings (see table).

Commercial Benefits

1. *To what extent did capital projects leverage other donor and private investor participation?* There were a few cases in Egypt where an A.I.D.-funded study or an A.I.D. project generated participation by other donors. There were no cases of private investor participation.

2. *Did capital projects generate commercial follow-on U.S. sales after project completion?* Commercial (non-A.I.D. funded) sales have been very limited. In many cases U.S. firms grew dependent on A.I.D. funding and were slow and even indifferent about developing the Egyptian market.

A.I.D. capital project procurement was almost completely tied to the United States, which allowed U.S. firms to play a major role in expanding Egypt's infrastructure. In many cases, U.S. firms introduced new and improved equipment and management techniques that greatly increased Egypt's technical efficiency. The new A.I.D.-funded capital projects often became the model or standard for other investments in a sector.

In many respects these major sectoral investments represented an important form of market development as U.S. standards and U.S. manufacturer's

brands were introduced into Egypt. In addition, with A.I.D. financing, U.S. engineering firms gained important access to the design and engineering jobs in Egypt's infrastructure market.

Once a firm enters and is established in a market it has an advantage over other firms; it should be able to develop the market with follow-on sales.¹ A "foot in the door" is important, but a firm must also be interested in aggressively marketing its products. While the team found many cases of U.S. firms that were successful in Egypt, most of them relied almost completely on U.S. government financing and were slow to develop the commercial market. In short, U.S. firms were not as aggressive as their European and Japanese competitors in marketing their products.

Moreover, firms from the United States and other countries had difficulty exporting to Egypt since Egypt was not earning enough foreign exchange to increase its level of imports. From 1980 to 1991, real imports declined 1 percent a year. The stagnation of the Egyptian market meant that neither the United States nor its competitors were able to achieve significant growth in exports to Egypt.

Developmental Benefits of Capital Projects

3. *Did capital projects generate a high economic rate of return?* While A.I.D. capital projects helped create an infrastructure base that doubtlessly contributed to the continued growth of the Egyptian economy, the economic and financial rates of return on the A.I.D. capital projects were mixed and not that high.

¹The team believes that this proposition holds even in the case of capital projects. While it is true that large projects are typically "lumpy" and do not usually require replacement of major equipment for a number of years, a need for other items would be expected over shorter intervals, such as spare parts and maintenance kits. Since A.I.D. capital projects in Egypt often included ample funding for spares (see Section 3) the immediate follow-on U.S. commercial sales *directly* resulting from the projects would be less. But the hypothesis being tested by this study really has to do with *indirect* follow-on effects. To what extent did the project provide a "foot in the door," leading to sales not part of the project, such as other projects or components of the power system or other lines of business in which U.S. firms are active?

The capital projects analyzed in this study were all designed to address critical development needs: In the electrical power sector A.I.D. provided 25 percent of Egypt's electricity capacity, the A.I.D. telecommunications projects introduced a modern telephone system in Cairo and Alexandria, and a series of A.I.D. projects rehabilitated and expanded the water and sewage systems serving more than 23 million Egyptians. The projects were designed and built to high technical standards and were operated efficiently. These and other capital projects provided the basic infrastructure that was a precondition to development. Nevertheless, even with technically sound projects, the failure of Egyptian institutions to price their products sufficiently high to cover costs created a number of serious problems.

Data from the economic analysis of the nine capital projects shows a mixed picture but generally low to medium financial and economic rates of return.² Economists generally expect a project in a developing country to yield an economic rate of return of at least 10 to 15 percent—that is a minimally acceptable level. A highly satisfactory project would have a rate of 20 to 25 percent. The three Egyptian electrical power projects had an average rate of only 6.4 percent. The three telecommunications projects evaluated, at 12 percent, were much better. The low rates are not due to technical problems—the projects were well designed, used appropriate technology, and were operated in a technically sound manner. In large measure, the poor performance was due to poor economic policies, such as government price controls, regulations, subsidies, and employment and management structures that resulted in inefficient production and inefficient use of project outputs.

4. *Did the capital projects:*

a. *Deliver important benefits to Egypt's private sector?* The infrastructure provided under the A.I.D. program—reliable power, telephones, and water—helped support the strong private sector growth of the 1980s.

²Financial analysis examines project costs and benefits using market prices. However, in Egypt, as in many developing countries, subsidies, price controls, and regulations distort prices. An analysis of a project using such distorted prices would yield misleading results. An economic analysis takes the distorted and controlled market prices and re-prices them at their competitive economic value. An economic rate of return analysis is based on those competitive economic costs.

b. Contribute to reductions in poverty and help meet basic human needs?

While it was not possible to quantify benefits in monetary terms, the water and sewerage projects provided health benefits. These projects helped reduce water-borne disease and improved hygiene. A key water and sanitation health benefit has been the dramatic (more than 50 percent) reduction since the mid-1970s in the diarrhea death rate for infants and children. The drop in the death rate is due in part to clean water and sewage treatment, but other factors were also important in lowering the death rate. The electrical power and telecommunications projects provided only indirect support for basic human needs.

5. How sustainable have the capital projects been? Capital projects have been operating well, but several factors threaten future project sustainability: inadequate financial resources, uneven operations and maintenance practices, and inadequate employee training and compensation.

6. Under what circumstances did capital projects help in policy reform? The Egyptian economic policy environment constrained economic growth. A.I.D. had great difficulty pushing for policy reform through both its capital projects and other types of assistance. Capital project policy conditionality was often not achieved or only met years after a project was initiated. In the last few years the pace of policy reform has greatly improved.

Development, of course, means more than just building infrastructure. Capital projects need to operate efficiently, and that depends on effective management and adequate finance. A.I.D.'s capital projects in Egypt included a number of policy reforms designed to improve the institutional and financial sustainability of the projects. These reforms were included as conditions in the project agreements, but the actual implementation of those conditions proved difficult.

When projects face implementation problems, conditionality may have to be modified. Similarly, if an economic situation changes, there may be good development reasons to modify or waive conditionality; conditions may also be modified for nondevelopment reasons, which was the case in Egypt. Since political and security concerns dominated U.S. programs in Egypt, it was difficult for A.I.D. to stand firm when economic policy reforms were not met. Often political considerations won out over development concerns. This problem was not unique to capital projects—it affected all A.I.D. programs in Egypt, capital projects as well as other forms of assistance.

Compatibility of Commercial and Developmental Objectives

7. *Was there a trade-off or conflict between development and U.S. commercial interests?* In Egypt, equipment and technology were selected on the basis of the country's developmental needs rather than U.S. commercial interests. U.S. commercial concerns did not distort the developmental benefits of A.I.D. capital projects—projects were not designed to maximize U.S. commercial interests.³

Conclusion

In the 1970s inadequate infrastructure was holding back Egypt's economic development. A.I.D. capital projects provided a boost to development by funding a major infrastructure expansion, which, in turn, supported growth in industry, commerce, and tourism. There were also important long-term "quality of life benefits" for Egypt's population from the water and sewerage projects—reduced disease and death rates and a healthier environment.

While there were clear developmental benefits from the A.I.D. capital projects, in many cases these benefits did not justify project costs. The economic rates of return ranged from low to medium.

U.S. firms benefited from the A.I.D. program on the first round because procurement was tied to the United States. However, non-A.I.D.-financed follow-on sales have been limited. In fact, over the 1977-1992 period, total U.S. exports to Egypt have barely equalled total U.S. government assistance to Egypt. Part of the problem may be the failure of U.S. firms to aggressively market their products. An even bigger problem might be the low appeal of the Egyptian market to U.S. firms. A poor economic policy environment, a continual scarcity of foreign exchange, and an economy dominated by government firms have posed obstacles for foreign firms seeking to increase their exports to Egypt. A likely added hurdle for U.S. firms is the fact that historically the dominant trading relationships for Egypt have been with European countries.

³A different question is whether the selection of capital projects as a mode of assistance (rather than technical assistance or Cash Transfers) biases the process in favor of U.S. equipment exports. By selecting capital projects, rather than other forms of assistance, A.I.D. in effect earmarks the procurement benefits to U.S. firms.

The A.I.D. capital projects included conditionality designed to improve the policy environment. However, nondevelopmental interests proved to be more important and economic policy reform usually took a back seat to U.S. political and security concerns. As a result, many of Egypt's economic problems continued to relate to inappropriate economic policies. The poor policy environment was probably the main reason for the relatively low economic performance of the evaluated capital projects as well as the inability of U.S. firms to establish new markets there.

The effectiveness of A.I.D. policy reform efforts has been constrained by U.S. political interests. The USAID Mission believes that with the ending of the Cold War in 1989, and Egypt's growing economic problems, the environment has changed and the Government of Egypt is more willing to make critical policy changes.

The Mission believes that as a result of A.I.D. pressure, changes have started. For example, in 1991 the Government of Egypt implemented an International Monetary Fund Stand-By and a World Bank Structural Adjustment Loan. Changes in some prices and the removal of many subsidies and controls have greatly improved the economic viability of A.I.D. capital projects. But it is still too soon to know whether the new "reform attitude" will last; it appears to be heading in the right direction, however.

Summary of Key Findings for Egypt

- The A.I.D.-funded capital projects supported public utilities that provided important services in support of Egypt's economic development.
- The economic rate of return on capital projects varied greatly. For telecommunications projects the rate was satisfactory at 12 percent. For electrical power projects the rate was low at 6.4 Percent. It was not possible to quantify an economic rate of return for water and sewage projects.
- Projects were clearly designed to meet Egypt's developmental needs, not to serve the interests of U.S. exporters.
- From 1977 to 1992 the United States was far and away Egypt's largest donor of both military and economic assistance. However, U.S. exports to Egypt barely equalled U.S. assistance levels, and Egypt was using little of its own foreign exchange to purchase U.S. goods. Thus, U.S. assistance does not appear to have generated significant commercial follow-on exports.
- U.S. exporters and engineering firms were clearly helped by the projects (since nearly all procurement is tied to the United States), but there was little commercial follow-on business.
- U.S. firms showed only limited interest in developing the Egyptian market. European and Japanese firms marketed their products and services much more aggressively.
- Capital projects were not very successful in encouraging policy reforms. U.S. political interests often took precedence over development objectives.
- Egypt has had a poor economic policy environment, which harmed both capital project performance (low economic rates of return) and U.S. export performance (Egypt has not been an inviting market since imports have been stagnant from 1981 to 1991).

Ranking Selected A.I.D. Capital Projects in Egypt

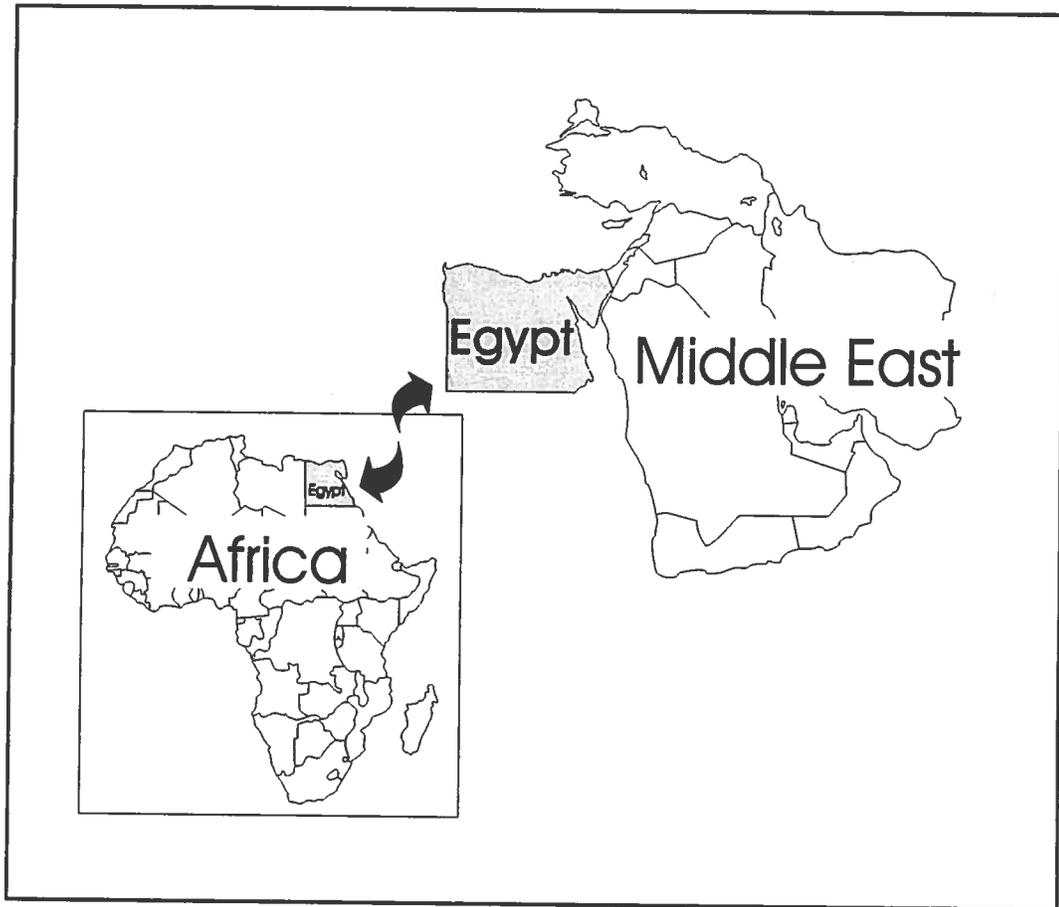
This matrix ranks sectoral groupings of capital projects according to the degree to which each hypothesis was confirmed by the evaluation findings. The scale ranges from low to high as follows: very low, low, medium, high, very high.

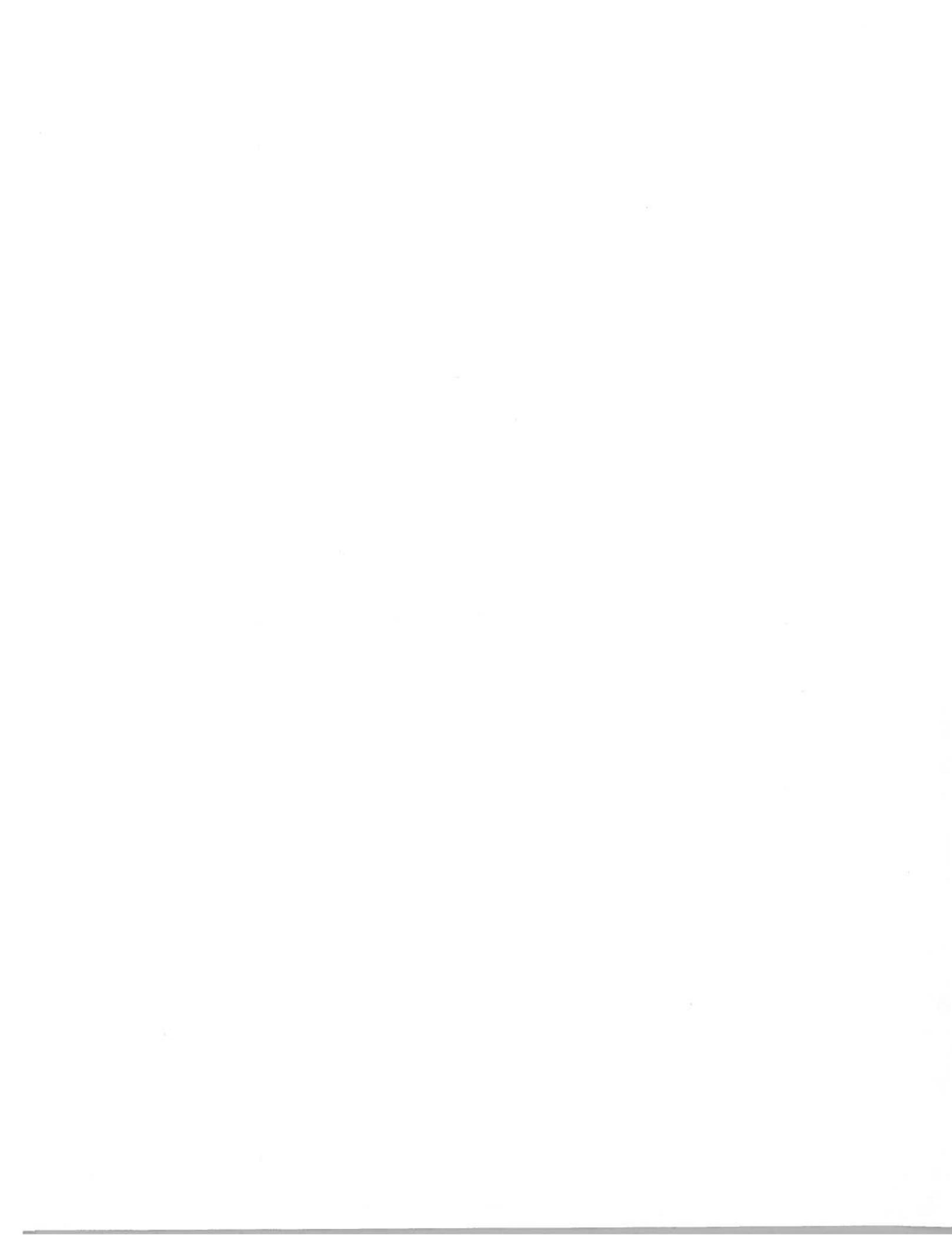
HYPOTHESES	SECTORS		
	Water & Sanitation	Electricity	Telecommunications
Commercial Benefits			
1. Capital projects leveraged non-U.S. financial resources for U.S. procurement participation.	LOW	LOW	LOW
2. Capital projects generated commercial, follow-on U.S. sales after project completion.	VERY LOW	LOW	LOW
Developmental Benefits			
3. Capital investments generated a high economic rate of return.	N.A.	LOW	MEDIUM
4. Capital projects:			
a. Delivered important benefits to Egypt's private sector.	LOW	HIGH	HIGH
b. Helped directly meet basic human needs.	HIGH	LOW	VERY LOW
5. Capital projects were effectively managed and maintained for sustainable development.	LOW	MEDIUM	MEDIUM
6. Capital Projects supported sector policy reform.	LOW	LOW	LOW
Trade-off Between Commercial and Developmental Benefits			
7. Capital project technologies were designed and selected based on their importance to the development of the host country rather than U.S. export interests.	VERY HIGH	VERY HIGH	VERY HIGH

GLOSSARY

A.I.D.	U.S. Agency for International Development
ARENTO	The Arab Republic of Egypt National Telecommunications Organization (The Egyptian telephone company)
CDIE	Center for Development Information and Evaluation (A.I.D.'s central evaluation office)
CIP	Commodity Import Program (an A.I.D. program that finances a broad array of imports)
EEA	Egyptian Electric Authority
ESF	Economic Support Fund
GOGCWS	General Organization for Greater Cairo Water Supply (Cairo's water company)
GOSD	General Organization for Sanitary Drainage (Cairo's sewer company)
IMF	International Monetary Fund
NECC	National Electrical Control Center
UPS	Unified Power System
USAID/Egypt	The A.I.D. office in Egypt
WWCG	Wastewater Consultant Group

MAP OF EGYPT





1. INTRODUCTION

Background

This paper examines whether A.I.D. capital projects can advance U.S. commercial interests while supporting economic development.

Many ideas have been put forth as a rationale for capital projects. Since the Agency for International Development (A.I.D.) and its predecessor organizations have been carrying out capital projects for more than 40 years, it is useful to examine the Agency's experience before launching a new effort. Egypt is one of the few countries with a large capital projects portfolio covering many sectors spanning over 15 years. Egypt, therefore, is an ideal candidate for this field study.

During the 1950s and 1960s U.S. economic assistance funded a wide range of capital projects throughout the developing world. This assistance continued into the 1970s, but with the advent of the basic human needs approach, funding for capital projects declined. Funding declined further during the 1980s with the "Four Pillars," which deemphasized resource transfers in favor of focusing assistance in ways that would improve overall efficiency. In recent years A.I.D. funding of capital projects has been limited, except in several large Economic Support Fund (ESF) countries such as Egypt.

Some experts question the developmental benefits of capital projects. They point to the 1950s and 1960s, when developing countries made large capital investments that seemed to generate few economic benefits. These critics also allege that the few benefits that occurred were often directed toward the well-to-do. The benefits were supposed to eventually trickle down to the poor, but they rarely seemed to improve the lot of the poor. Large capital investments became "white elephants" because they imposed a maintenance and financial burden that was well beyond the capability of most developing countries. Capital projects also showed an urban bias because capital investments were generally concentrated in cities, which were often more prosperous and already received more government services than rural areas.

Almost all recent studies reject such a sweeping negative view of capital projects. The literature review for this study found considerable evidence that technically and economically sound capital projects operating in a good policy setting can have high rates of return and deliver substantial developmental benefits.

A final concern is whether U.S. trade promotion interests are compatible with concerns for a developmentally sound capital projects program.

On the opposite side, a number of arguments and hypotheses have been put forward by proponents of capital assistance. They argue that capital assistance helps support development, promotes U.S. exports, and is often more appropriate than other types of assistance. Many of these arguments may be valid, but others may only be true in special situations. It is difficult to draw firm conclusions because most of the hypotheses are based on anecdotes rather than on a broad set of documented experiences. It is important, therefore, to examine actual A.I.D. project experience to determine the circumstances in which various hypotheses hold true.

It is important to note that this report is not an impact evaluation, nor an evaluation of implementation and management results of individual projects. It judges the development and commercial success, effectiveness, and efficiency of nine A.I.D.-funded capital projects in Egypt. The analysis in this report tests the hypotheses concerning the development and commercial benefits of capital assistance to determine whether those arguments are in fact reflected in actual A.I.D. experience. A separate companion report (Hanrahan et al. 1994) provides estimates of financial and economic rates of return on these projects.

Objectives

This country case study examines A.I.D.'s experience with capital projects in Egypt in order to judge whether the projects were effective in promoting Egypt's economic development while also promoting U.S. commercial interests. The findings from the Egypt study will help A.I.D. in considering further support for capital projects worldwide.

The analysis is configured into two broad categories—*commercial benefits* of capital projects and *developmental benefits*. Although the assessment considers each of these dimensions separately, it also evaluates the relationship and trade-offs between them. The analyses of commercial and development considerations are structured around seven hypotheses posed as questions.

What were the U.S. commercial benefits of A.I.D.-funded capital projects in Egypt? The evaluation examined the direct (project specific) and follow-on effects of capital projects on U.S. trade, as well as the effect of these projects on the overall climate for U.S. business and investment in Egypt.

What were the developmental benefits of the capital projects? This field evaluation

- Measures the economic efficiency of the capital projects
- Examines the extent to which the projects have helped meet basic human needs and have supported private sector development
- Examines the effectiveness of the capital projects in supporting policy reform
- Assesses the financial and institutional sustainability of the capital projects

Are there conflicts between trade and development objectives? The assessment also examines the extent to which development and U.S. trade objectives are compatible in the design and implementation of capital projects. It attempts to answer the basic question: To what extent can the two objectives be pursued simultaneously in the same project without creating a trade-off that pits one against the other. An example would be the selection of technology for a particular project. A capital-intensive technology might be lucrative for U.S. exporters but generate little employment in Egypt, whereas a labor-intensive technology might generate jobs in Egypt but not lead to big-ticket U.S. exports. A capital-intensive development strategy that concentrates on some of the new frontier industries in which the United States has a comparative advantage, such as health care, data processing, or environmental protection, will help U.S. commercial interests but may not necessarily be compatible with development. Much will depend on the developing country's stage of development, relative factor endowments, policy and institutional setting, and human resource capabilities.

In summary then, the overall objective of this Egypt capital projects assessment is to determine to what extent and under what conditions the examined A.I.D.-financed capital projects were effective in achieving two objectives: (1) promoting U.S. commercial interests and (2) fostering development.

Evaluation Issues

The seven hypotheses were formulated to analyze A.I.D.'s worldwide capital projects program. In the Egypt case study, they are used to analyze A.I.D.'s capital projects program in three sectors: electric power, telecommunication, and water and sanitation. The seven issues, listed below, capture the commercial and development arguments related to capital projects.

- *Commercial Benefits*
 1. To what extent have capital projects leveraged other donor (and private investor) participation in A.I.D. capital projects?
 2. Under what circumstances have capital projects generated follow-on U.S. commercial sales after project completion?
- *Developmental Benefits*
 3. Have capital investments generated a high economic rate of return?
 4. Did the capital projects
 - Deliver important benefits to Egypt's private sector?
 - Help meet basic human needs?
 5. Effective management and maintenance of capital equipment and infrastructure is one major determinant of sustainable development. Sustainability requires significant development of host country institutions to support the capital projects. How have capital projects addressed these problems?
 6. Under what circumstances have capital projects helped in policy reform through sector or subsector conditionality? Under what circumstances have they undercut policy reform efforts?
- Is there a conflict or a trade-off between commercial and developmental objectives?
- 7. Under what circumstances and to what extent have development and U.S. commercial interests been compatible?

- To what extent have capital projects been selected and designed on the basis of their importance to development rather than to U.S. export interests?
- To what extent has U.S. capital investment technology been appropriate to the needs of developing countries?
- To what extent have capital projects that concentrated on areas in which the United States has a technological edge (developing a future U.S. export market) effectively contributed to development?
- To what extent have capital projects directly and indirectly (through "additionality") supported U.S. exports of goods and services while supporting development?

Evaluation Methodology

The methodology for the overall assessment is detailed in the Capital Projects Evaluation Design (Liebersohn 1992). Prior to the Egypt fieldwork, extensive research was conducted in Washington, D.C. In *Capital Projects: Literature Review and Supplier Survey*, a study of 68 completed A.I.D. capital projects from 25 countries, analyzed the seven development and commercial issues against the findings of A.I.D. evaluation experience. A similar review of World Bank experience in five capital project sectors analyzed the Bank's experience against the development issues in this study. Interviews with more than 50 U.S. suppliers and exporters tested the commercial and trade issues. A review of published literature on commercial and trade benefits rounded out the Washington-based analysis.¹

In addition, a separate background study (Fox 1994) on U.S.-Egypt aid and trade relationships has been completed. The study examined total U.S. assistance to Egypt (both economic and military assistance) over 15 years (1976-1991) and examined the relationship of aid to the level of U.S. exports to Egypt. The study found little linkage between U.S. aid levels and U.S. exports to Egypt. The findings are summarized in Section 4 and Appendix E of this report.

¹The findings from the Washington-based study appear in *Capital Projects: Literature Review and Supplier Survey* (forthcoming).

Egypt was selected for this case study for several reasons. First, most developing countries have implemented fewer than a dozen A.I.D.-funded capital projects, whereas Egypt has had more than 50 such projects. Thus as a case study, Egypt allows a broad selection of projects covering a wide range of sectors. In addition, many of the Egypt projects were completed several years ago, so it is now possible to clearly see project benefits. However, the very size of the program had its drawbacks—the large number of projects funded at a high dollar level is not typical of most countries receiving A.I.D. assistance. Nevertheless it was decided that Egypt offered a good opportunity for analyzing a broad range of completed capital projects that would shed light on the commercial and developmental issues.

This report focuses on seven completed and two nearly completed capital projects. The nine projects were analyzed with respect to the seven central issues cited above. A detailed analysis of the sectors and projects are contained in Appendixes A, B, and C of this report. The economic and financial analysis of the nine Egypt capital projects appears in a separate companion report (Hanrahan et al. 1994).

This investigation relied on key informant interviews, project site visits, and a review of existing project documentation for data collection. The data collection instruments included (1) a basic project information data form completed from existing project documentation² for each of the projects studied and (2) a key informant interview data collection form, completed at each key informant interview.

The findings and conclusions in this report are based on information gleaned from project documents and key informant interviews. Key informants were chosen from among the following:

- Egyptian Government executives from implementing and operating agencies
- Egyptian government technical and operating officials from implementing and operating agencies
- U.S. equipment suppliers
- USAID/Egypt Mission staff

²Project Papers, evaluations, audits and other special reports that exist for each project.

- U.S. Embassy Commercial Attache, technical assistance contractor staff, Egyptian private sector firms, among others.

Interviews were conducted in close conformance with accepted A.I.D./CDIE evaluation methodology guidelines. It was clear from the interviews that there were factors specific to Egypt that had influenced some of the findings. These factors are discussed in Section 3.

The interviews resulted in a large body of opinion on capital projects in general, on ongoing capital projects, and on the synergistic effect of several capital projects completed or ongoing in Egypt. This information is also analyzed in Section 3 of this report.

Selection of Sectors and Projects

The Capital Projects Concepts Paper developed a definition of capital projects:

A project and supporting activities which encourages economic development by creating, replacing or rehabilitating physical infrastructure and industrial plant and equipment in a developing country.

The definition stresses *physical assets* and *development*. By focusing on *physical assets* the definition includes the bricks and mortar of construction along with capital equipment and machinery. It does not include capital finance projects that provide only credit or loans, nor does it include consumption activities and activities that lack a project focus. The definition does include programs that finance the import of equipment and spares (such as Commodity Import Programs [CIPs]) but only if the equipment can be directly tied to a project.

The *development* requirement means that the project must be related to the improvement of a country's economic and social welfare. The *supporting activities* include training, technical assistance, and equipment to support the management, operations, and maintenance of the capital project.

The process for selecting A.I.D. capital projects in Egypt followed this sequence:

- To better measure results or final impact, only completed, or nearly completed, projects were included.

- Since development and commercial factors differ among sectors, it was decided that at least three sectors would be examined.
- Because of the great variations among projects within a sector, it was decided that at least three projects would be evaluated in each sector.
- The evaluation focused on seven issues; therefore projects were chosen that addressed four or more of those issues.
- Documentation on project performance is important for assessing projects that may have been implemented over a period of 5 or more years and completed many years ago. To be included, each project had to have a Project Paper, a midterm evaluation or final evaluation, and at least one other appraisal or audit report.

Using the above criteria, 34 projects were identified. The assessment concentrated on urban infrastructure projects, because they represented a major share of the A.I.D. portfolio in Egypt. To provide a broad database, nine projects were selected in three sectors: electrical power plants, telecommunications, and potable water and wastewater treatment and collection systems.

2. PROGRAM SETTING

Country Background

This evaluation took place in October 1992 and covered projects that were launched in the late 1970s and early 1980s. To put those projects in the proper context, it is important to remember the conditions that were in effect when the projects were designed: the economic situation at that time; the political environment, including U.S. political concerns; and the objectives A.I.D. was trying to achieve. This evaluation, of course, analyzes the appropriateness of the capital projects for the 1990s, but it is important to remember how the projects were selected and what they were designed to achieve. Before going to the 1990s, a step back to the situation in the late 1970s is helpful.

The Egyptian economy and population center around the resources provided by the river Nile. In the 1970s, Egypt's 38 million people lived almost entirely on the 4 percent of arable land that comprises the Nile Valley and Delta. (The population in 1992 is an estimated 57 million.)

Cairo, Egypt's capital at the edge of the river Nile, had a population of only 6 million people in the late 1970s (compared with an estimated 13 million in 1992). During the 1970s Cairo was experiencing a 4 percent annual population growth rate, which put severe constraints on the Government of Egypt's ability to provide adequate jobs, housing, water, and sewerage to large sections of its population.

For almost a decade following Egypt's 1956 Suez Canal nationalization, the economy performed well and Egypt experienced steady, if unspectacular, growth. From the mid-1960s through the early 1970s, however, economic conditions became relatively stagnant.

Egypt's economy changed suddenly beginning in 1973 because of a series of events: the 1973 War with Israel, the jump in world food and commodity prices, Sadat's "Turn to the West," partial economic liberalization of the Egyptian economy, and the official turning away from Soviet assistance. In conjunction with these events came an influx of new Arab and Western funds.

The new flow of funds energized the Egyptian economy, driving up the level of economic activity without altering its low level of efficiency. The increased availability of external resources made it possible for the Government to insulate the Egyptian lower classes from changes in international commodity prices by the extensive use of subsidies and price controls. In addition, Egypt's increasingly overvalued exchange rate, administered prices, and direct subsidies perpetuated and exacerbated price distortions and resource misallocations already plaguing the economy.

By the late 1970s all of Egypt's donors—the Arab donor states, the International Monetary Fund (IMF), the World Bank, and, A.I.D.—agreed that substantial economic reforms were required if Egypt was to move toward more rapid economic growth. To address the issue of Egypt's growing fiscal imbalance, two main structural features were targeted by donors: (1) the Government of Egypt's price subsidies throughout the economy and (2) the imbalance between the public sector's expenditures and revenues.

It was felt that more efficient resource allocation through greater reliance on market mechanisms would facilitate long-term economic viability, permit reduced foreign assistance, and stimulate growth. Donors working in Egypt believed that until these major structural economic reforms were accomplished, Egypt's prospects for a resilient economy were not good.

The Economic and Political Setting for the A.I.D. Program

One of the most important foreign policy objectives of the United States in the late 1970s was the achievement of a comprehensive peace in the Middle East. The United States felt that Egypt played a critical role in reaching this objective due to its strategic location, size, and regional political importance.

During the late 1970s Egypt's Government shared the desire for peace, and as such, the United States was extremely concerned with maintaining political stability in Egypt. The United States-Egyptian affiliation began taking on new meaning soon after Egypt abrogated its Treaty of Friendship with the Soviet Union in 1976. In 1978, Egypt came to rely even more heavily on financial and military aid from the United States as it became isolated from the rest of the Arab world for signing the Camp David peace treaty with Israel.

The political backdrop to the A.I.D. program in Egypt has made this program uniquely political. As A.I.D. funding levels dramatically increased after the Camp David Accords, A.I.D. had to focus on program areas in which large amounts of funds could be spent. In addition, A.I.D.'s leverage with the

Government of Egypt was curtailed because of the political necessity of disbursing large amounts of funds every year.

Through most of the 1980s A.I.D.'s program in Egypt continued on the same basic philosophy. The political relationship of the United States with Egypt during this period was considered decisive in achieving peace in the Middle East and A.I.D.'s program reflected those political-strategic objectives. This is in contrast with most other A.I.D. country programs, where development concerns have taken relatively greater priority.

The predominance of political over developmental concerns in Egypt has been most evident in enforcement of policy reform. Disbursement of funds can normally be withheld for noncompliance in carrying out policy reforms, but in the case of Egypt, funds have continued even when reform objectives have been delayed or not met.

Egypt's unique political posture with the United States is an important backdrop to this evaluation. Many of the problems examined in this report deal with the issues of sustainability and policy reform. As such, although many of these types of objectives have not achieved targeted levels—in terms of user fees, tariff restructuring, or operations and maintenance cost recovery—these shortcomings must be considered in light of the political pressures to continue the flow of funds to this important ally regardless of compliance with project covenants.

The A.I.D. Country Program

From mid-1974 through 1978, the United States committed more than \$2.3 billion in economic assistance to Egypt. Following the Camp David peace agreement in 1979, Congress approved an additional 3-year \$300 million Peace Program to supplement regular program appropriations of \$750 million per year.

In FY 1979, A.I.D.'s annual economic assistance to Egypt was \$835 million in loans and grants with another \$275 million in PL 480 funding. Of the A.I.D. funds, \$320 million was spent on CIP, \$180 million on "productive" infrastructure (e.g., telecommunications, energy, industry), \$123 million on "social" infrastructure (e.g., housing, water, and sewerage systems), and \$212 million for other activities.

The development problems of the 1970s and 1980s are strikingly similar to those of the 1990s. While much economic and social progress and improvement has been achieved, several of the problems cited in the 1980 A.I.D.

Country Development Strategy Statement still sound familiar today, 12 years later:

- Increasingly adverse population/land ratio in the Nile Delta
- Low levels of resources for new public investments and inadequate maintenance of old investments
- Inappropriate Government of Egypt development priorities and policies, which misallocates resources
- Inadequate management for a broad range of development activities and services
- Centralized decision-making by the Government, which inhibits decision-making and has contributed to the misallocation of resources

Given this set of conditions, much of A.I.D.'s assistance in the 1970s and 1980s revolved around a strategy that included the following goals: (1) increased productivity of the public sector, (2) reduction in population growth, (3) decentralization of government administration and increased autonomy of local government entities, (4) expansion of sustainable programs for housing and sanitation to Egypt's poor, and (5) improvement in the outreach and effectiveness of the Government's services to the poor. Within this strategy A.I.D. targeted programs that encouraged the private sector. The industrial and agricultural sectors were expected to be the driving forces for increasing productive output, employment creation, and eventually for mobilizing resources necessary to support improvements in the living standards of the poor.

It was felt that within this framework, infrastructure development was essential not only for the necessary development and expansion of industry and agriculture, but also for the shelter and environmental needs of the urban poor. The Mission's strategy concluded that large investments were required to rehabilitate and expand Egypt's physical industrial and infrastructure facilities as a prerequisite to sustained economic growth and employment expansion.

The A.I.D. Capital Projects Program

During the 1970s most of Egypt's population lacked adequate access to urban services such as potable water, sewerage, refuse collection, electricity, health, and education. A.I.D. felt that to some degree this situation was attributable to the delivery mechanisms, which were heavily constrained by the econom-

ic and institutional inefficiencies of the government implementing institutions. For example, in the electrical power sector, prices were considered to average about one-quarter of the true economic cost of electricity. A barely functioning telecommunication system, considered to be a major obstacle to business efficiency, was consistently plagued by a low rate of investment and low tariff rates. Similarly, actual receipts collected for water represented only 10-20 percent of the costs of the water supply.

A.I.D.'s infrastructure strategy was based on the assumption that Egypt's badly deteriorated industrial infrastructure was a major constraint to existing industrial productivity and to attracting greater private investment. It was also well recognized that in order to develop sustainable infrastructure the Government of Egypt had to restructure its management and raise tariff rates. A.I.D. strategies for both productive and social infrastructure projects called for the development of a rate and price structure that would allow the Government to provide water, sewerage, telecommunications, and electricity services while recovering adequate funds to maintain the systems.

For urban infrastructure, A.I.D. targeted policy problems that needed to be changed:

- Low tariffs that precluded the funding of effective operations and maintenance
- Lack of self-financing for even a portion of system expansion
- Overstaffed and inefficient public utilities and inadequate management
- The lack of a coherent public utility investment plan

The need to spend large amounts of A.I.D. money in Egypt and the apparent need for infrastructure projects led to the placement of a large portion of the A.I.D. portfolio into capital projects. In the late 1970s, urban infrastructure accounted for nearly \$4 billion in obligations or approximately 45 percent of the A.I.D. Egypt budget. A few of the Mission's projects for 1979 included support for gas turbine generators in Helwan, electric power distribution for Cairo and Alexandria, water and sewage projects in Cairo and Alexandria, and a major telecommunications rehabilitation and expansion program.

With the help of the United States, Egypt has over the past 15 years made important progress in developing the infrastructure that is critical for economic growth. A.I.D. has financed reliable power generation and telephone service, clean water, and improved sewage disposal in Egypt. A.I.D. has also financed

the installation of more than 2,500 megawatts or 25 percent of Egypt's electric capacity. In telecommunications, A.I.D.-financed U.S. equipment and technology have brought reliable telephone service to more than seven million people in Cairo and Alexandria. In the environmental area, U.S. engineering and construction companies have helped Cairo, Alexandria, and other major cities to rehabilitate and expand water and sewerage systems serving more than 23 million Egyptians.

Despite these accomplishments, a full complement of reliable and technically efficient public utility services are not yet available to a large portion of Egypt's urban population. Existing public utility infrastructure has deteriorated and new construction has not kept pace with rapid population growth in Egypt's large urban areas. Further expansion and improvement of urban public utility infrastructure in large urban areas is essential to improve the quality of life and productivity of the Egyptian population.

3. FINDINGS FROM THE FIELD DATA ANALYSES

Some aspects of the Egypt A.I.D. program and the subset of its capital projects portfolio are not present in other A.I.D. country programs. These factors may limit the generalizations of the evaluation's findings to other countries. Four such factors are described below.

1. *The A.I.D. program political mandate.* To varying degrees, every A.I.D. country program is designed to support U.S. political interests. In Egypt, probably more than in other country programs, political concerns clearly drove the program. The policy reform goals related to capital projects were undercut in the early- and mid-1980s as the political goals of the country program overrode the development goals of the capital projects. On the other hand, other forms of assistance (e.g., technical assistance projects, CIPs, Cash Transfers) were not that effective either in achieving policy reform under these politically driven conditions.

2. *Program size/project size.* A.I.D. is the largest donor in Egypt, having provided over the last 15 years more than half of all Official Development Assistance. A.I.D.'s Egypt program is the second largest in the world (Israel is the largest), and the Egypt projects tend to be the largest A.I.D. funded in the world. Since 1975, urban infrastructure has accounted for approximately 45 percent of A.I.D.'s total Egypt program. This figure compares to A.I.D.'s worldwide program where capital projects represent roughly 5 to 6 percent of the portfolio. Given the size of the Egypt projects, the program in Egypt accounts for a significant percentage of A.I.D.'s worldwide capital project portfolio.

The capital projects examined for this assessment also represent A.I.D.'s largest efforts worldwide, typically ranging in the hundreds of millions of dollars. The Cairo Sewerage II project, the portfolio's largest project at \$806 million, is bigger than any other A.I.D. program worldwide and is roughly the size of A.I.D.'s Development Fund for Africa in 1991 (for some 40 countries). Given the level of A.I.D. funding in Egypt, it is not unreasonable to question why A.I.D.'s policy reform efforts in Egypt have not been more successful in gaining program or even project-specific leverage. The answer is that even with

a large program and large projects, A.I.D.'s development goals have always been subordinate to U.S. political goals.

3. *Concentration on urban projects.* A.I.D. program strategy in Egypt seeks to promote development of the overall economy, and the capital projects program focuses on the urban areas of the country. The Egypt program is A.I.D.'s biggest urban development effort anywhere in the world. In most other countries A.I.D. strategy favors rural development.

4. *Synergistic effect of the total capital projects effort.* Over the years A.I.D. capital projects have focused on improving public infrastructure across the board—covering nearly all sectors. A large number of A.I.D. capital projects have improved coverage of essential services for a very large urban population.

In determining the benefits of the projects, the evaluation team had to answer the question: Could or should each project be examined as a stand-alone unit or did the project have wider impact? Many Egyptians (in both the public and private sector) reported that the overall quality-of-life improvements in the past 10 years in Cairo and in other cities have been very noticeable. They spoke in terms of all public infrastructure having been improved, not just one sector. The evaluation found that the cumulative effect of improvements in all urban infrastructure had a multiple impact on living conditions, economic growth, and tourism. The urban cities had become more livable and economically more productive.

How has this apparent synergistic effect of the A.I.D.-funded projects influence private-sector-led growth? Some respondents gave examples of how overall improvements in certain services had led international firms to base their regional offices in Cairo, a move that 10 years ago would never have been considered. All respondents said that the commercial, light industry, and tourism sectors of the economy have also greatly benefited from the improvement in public sector infrastructure.

Impact of Capital Projects on U.S. Commercial Interests

The relationship between capital projects and U.S. commercial interests is a major theme of this assessment. The importance of this issue is driven, in part, by congressional reaction to U.S. business demands for increased assistance in foreign markets through the foreign aid program. Four issues, or questions, relate to U.S. commercial concerns: (1) Have capital projects leveraged other donor (and private investor) participation in A.I.D. projects? (2) Have capital projects contributed to follow-on commercial sales of U.S. goods and services?

(3) Have capital projects focused on areas in which the United States has a technological edge? and (4) Has there been a "macro" linkage between overall aid and trade? And what role might capital projects assistance have played in such linkage?

In Egypt, the evaluation team interviewed a broad cross-section of U.S. technical assistance contractors and Egyptian representatives of U.S. manufacturers supplying goods under A.I.D.-funded projects. These firms were involved in (1) selling U.S. manufactured equipment, parts, materials, and other supplies and commodities; (2) providing services, such as U.S. engineering design and construction management; and (3) constructing facilities under contracts with U.S. construction companies.

Other Donor and Private Investor Participation

There are many bilateral donors in Egypt, and each tends to be the sole source of external support for projects they have initiated, or for which they have provided feasibility studies. There were two cases in the electrical power sector where an A.I.D.-funded study and an A.I.D. project generated other donor funding. However, other donors rarely made procurements from the United States. In most cases joint donor funding of projects was limited to World Bank coordinated efforts. There were no cases of private investor participation in A.I.D.-supported programs.

Follow-On Business

The A.I.D.-financed equipment and construction contracts represent a major and immediate U.S. commercial benefit of capital projects. This benefit results from the "Buy America" focus of the Egypt A.I.D. program whereby capital project procurement, and procurement for most other types of U.S. assistance, is tied to U.S. source and origin (i.e., the United States aid money has to be spent in the United States).

When A.I.D. finances a \$50 million capital project, U.S. equipment suppliers and engineering firms receive contracts for \$50 million. These contracts are important to U.S. firms that win the contracts. Since nearly all A.I.D. assistance to Egypt is tied to U.S. procurement, the United States commercial benefits are automatic—the United States provides aid, which is then spent in the United States.

Of more interest for this assessment, and what is intended by the phrase "follow-on business," is the secondary effect of tied aid—what happens after the A.I.D.-financed procurement ends? It is frequently argued that capital projects generate follow-on, commercial sales in future years.

The amount of follow-on non-A.I.D.-funded sales of U.S. manufactured products or U.S. engineering and technical services has been small in comparison to the volume of U.S. business carried out under the A.I.D. projects. More than half of the U.S. firms that supplied equipment and services for A.I.D.-funded capital projects stated they would have little if any business in Egypt if the A.I.D. capital projects program were to end. (See Box 1 for an example of one firm's experience).

Box 1. Follow-on Business

A senior manager for a major U.S. consulting firm working in Egypt reported that his firm's first contract in Egypt was in the late 1970s, under an A.I.D.-funded sanitation project. Since that time his local office, originally established in Cairo, has grown, employing more than 50 people, and has expanded to include a small office in Alexandria.

Over the past 10 years, his company has bid on several projects sponsored by the World Bank, the U.S. Corps of Engineers, and the Egyptian Government. It has won a few small non-A.I.D. contracts and continues to bid on non-A.I.D. jobs as they present themselves. The senior official believes that his firm's work in Egypt has been successful and profitable. The firm continues to work on A.I.D.-funded projects through host country contracts with only minor payment problems from the Government of Egypt.

His firm places much emphasis on training and has made efforts to train the Egyptian technicians and managers in a variety of formal courses and on-the-job training. He sees his firm contributing to Egyptian skills development beyond that needed in his own company. Several of his local managers have gone on to start local firms of their own.

The caveat to this scenario is that the firm would unquestionably leave Egypt if A.I.D.'s program were to end—A.I.D. represents 85 to 95 percent of the firm's business. Although the firm gets a few local or multidonor-funded projects, these alone are not enough to ensure profitable operations in Egypt.

In all of the sectors studied, two factors limited follow-on non-A.I.D.-funded sale of goods and services:

1. *Cost.* In most cases U.S. equipment and products, although considered of excellent quality and reliability, were comparatively more expensive than similar goods from European and Japanese competitors. Higher cost also applied to services from U.S.-based engineering consulting firms and construction companies. For both goods and services, this factor especially limited U.S. business with the Egyptian public sector because contracts were almost always awarded to the lowest bidder, quality considerations receiving low priority. (Of course the same practice of awarding contracts to the low bidder is followed by the United States and other governments.)

An additional problem is that even though the Egyptian private sector is growing rapidly, it represents a very small portion of the economy. Most of the business lies with public sector companies, and in many cases U.S. firms are too high priced to win "lowest-priced-bid" government contracts.

2. *Marketing practices and business strategy.* U.S. firms operating in Egypt generally lacked an aggressive marketing strategy or aggressive business tactics. Egyptian representatives of U.S. equipment suppliers, who also represent European and Asian suppliers, almost all said that U.S. firms did not seem to be as interested or motivated as their competitors in developing their Egyptian markets, nor did U.S. firms seem as aggressive in following up on opportunities for sales as firms from other countries. The success of Asian suppliers is especially significant since, just as for the United States, Egypt is not a traditional market for them.

Firms interviewed in Cairo cited numerous examples of poor responses to requests for product information or prices. One extreme example was of a U.S. supplier, which, invited by a Government of Egypt public utility to bid on a spare parts contract, did not respond to the invitation even though it had manufactured the equipment for which the spares were needed.

While there were some exceptions to the generalizations noted above the exceptions were few and involved mainly U.S. equipment and service firms that had well-established and successful international programs. More than half of the firms visited had policies of bidding exclusively on U.S.-government-funded work in Egypt, obviously limiting the diversification of their in-country portfolios.

Technological Edge

Time and time again officials from both the Egyptian public and private sectors commented on the high quality of U.S. equipment and the excellent performance of the A.I.D. projects. A separate issue is whether U.S. products have a technological edge over products from other countries. This issue has three parallel questions: (1) Can A.I.D. projects help develop future commercial markets for U.S. products for which the United States has a technological edge?³ (2) Have A.I.D.'s capital projects concentrated in areas where the United States has a technological edge? and (3) If they have, to what extent have the projects effectively contributed to development?

Based on key informant interviews with U.S. and Egyptian engineers, managers, and business people, it was clear that the United States did not have a technological edge in the sectors examined. The Germans, French, Italians, and Japanese all make comparable equipment and supplies at very competitive prices. The issue of technological edge, therefore, did not seem applicable. Respondents overwhelmingly agreed, however, that the high quality of equipment and technical assistance provided by A.I.D. projects was extremely significant in supporting Egypt's development goals.

A recurring theme voiced by all respondents was the high quality of U.S. products. Whether the products were small pumps, large generators, or technical assistance, U.S. firms were given high marks and were thought to have substantially assisted in transferring U.S. technology and U.S. professional standards to the Egyptian economy.

Another spin-off effect attributed to the A.I.D.-funded projects, apparently as a result of the quality edge of U.S. products, was the adoption of U.S. technical standards and specifications, U.S. management techniques, and a growing awareness of the importance of quality control. Respondents report that many Egyptian engineers now prefer U.S. management, methods, and equipment. This preference is manifested in the frequent adoption of U.S. technical standards, such as AWWA, ASTM, and ANSI specifications in Government of Egypt agency and private sector tenders. The Egyptian Electric Authority changed one of its tenders to modify European specifications to U.S. specifications so that U.S. equipment could be considered.

³Alternatively, why does A.I.D. need to develop commercial markets for a product over which the United States has a technological edge? The product should be able to win sales based on its own merit.

While examples were few, U.S. consultant and construction firms stated that increased exposure helped establish their operations in Egypt and helped them win other contracts as well. Two U.S. consultant/construction firms in the power sector reported that the establishment of their offices in Egypt had led to other contracts in Egypt and in the region that included management, hardware, and construction. Both firms have now set up their Egyptian project offices as regional offices.

The investigation found few examples of other bilateral donors financing U.S. equipment on other projects. In fact, one major telecommunications equipment firm that was a significant supplier for the four A.I.D. telecommunications projects lost a bid to start a joint venture plant in Egypt to a German firm. The U.S. firm was not able to maximize the advantage it had gained from being a major participant on A.I.D. projects.

The Linkage Between Aid and Trade⁴

When the United States finances projects and commodities, a potential market is created for follow-on spares and replacements. In addition, since U.S. assistance establishes U.S. products in the Egyptian market (introducing U.S. manufacturers and their brands, U.S. engineering firms, and U.S. standards and procedures) there should be a tendency for U.S. goods and services to be used in new non-A.I.D. projects. However, U.S. assistance programs do not appear to have developed a market for U.S. commercial exports:

- In Egypt the market for commercial spares and replacements may be small since A.I.D. capital projects often include funding for spares. In addition, follow-on procurement is often covered by other A.I.D. projects or through CIPs. Thus, with A.I.D. funding available, commercial sales may be limited.
- Overall, during the 15 years from 1975 to 1991, U.S. exports to Egypt have been slightly less than U.S. assistance levels (in constant dollars, \$28 billion of U.S. exports compared with \$30 billion of U.S. economic and military obligations). This fact strongly suggests that even though U.S. assistance has been tied to U.S. procurement, there has been no catalytic effect on U.S. exports.

⁴See also Appendix E.

- There is only limited evidence of a follow-on impact from U.S. capital projects and CIPs on the aggregate level of U.S. exports to Egypt. If the capital projects of the 1970s and early 1980s generated such additional U.S. exports, the additional exports came at the expense of other (non-U.S. government financed) products. In any event, it is clear that Egypt has been a poor market for U.S. products, and U.S. assistance has not altered this fact.

Rather than examining U.S. competitiveness and U.S. assistance levels (the supply side) it is also useful to look at the Egyptian market (the demand side).

Growth in Egyptian imports from the United States depends on two factors: The rate of growth in Egypt's total imports (the size of the market) and the U.S. share of total imports. If the market is stagnant and imports are not growing, any increase in imports from the United States must come through imports replacing those of another trading partner. A growing Egyptian import market, on the other hand, can mean more imports from the United States and from other countries. Egypt of course has to pay for its imports, and it needs foreign exchange to do that. Two of the major sources of foreign exchange are export earnings and aid receipts. If Egypt is to increase its imports, and if foreign aid is growing only slowly, Egypt must increase its own foreign exchange earnings by increasing its exports. Without growth in export earnings it cannot increase imports.

During the 1975-1991 period, Egyptian export earnings have grown very slowly. Egyptian imports have increased at an even slower pace. In fact, during the last 10 years there has been almost no real growth in imports. Overall, during the 1975-1991 period, the United States has been able to only marginally increase its market share in Egypt vis-a-vis the other industrial countries. (Most of that very limited increase has taken place since 1987, as the U.S. dollar depreciated relative to several key currencies.).

In summary, it appears that slow growth in the Egyptian market for imports (resulting from poor economic policies) has made Egypt a poor market for all industrial country exporters.

Conclusions on U.S. Commercial Interest

Capital projects have directly supported U.S. exports (through A.I.D.-financed exports) but have not been important in developing longer run U.S. export markets. One would expect U.S. exports to increase as U.S. aid helped

through market development—by establishing U.S. standards and manufacturer's brands in Egypt. Assistance for capital projects provides a window of opportunity for U.S. business, at which point it must be the initiative of U.S. businesses to develop markets for their products in Egypt. The follow-on exports and U.S. investment could be significant (but only if Egypt's capacity to buy foreign goods increases—which is heavily dependent on sustained improvement in Egypt's economic policy).

U.S. firms need to aggressively market their products and services. *Clearly the majority of U.S. firms in Egypt would not be working there without the existence of the A.I.D. program. In many cases they have grown dependent on A.I.D. funding and have been slow and even indifferent about developing their position in the Egyptian market. Neither CIPs nor capital projects can help U.S. commercial interests if U.S. firms are not aggressively looking for non-A.I.D. business.*

A.I.D. capital projects offer new opportunities and markets for U.S. businesses. The extent to which U.S. companies have made the most of these opportunities is questionable. Although faced with significant competition from European and Asian firms, U.S. goods and services are well respected in Egypt. U.S. firms have either been unwilling or unable to take advantage of this edge to create new markets for themselves. In contrast, most of the European and Japanese firms are much more actively marketing their products, although in the short run they have done no better than U.S. firms in expanding exports to Egypt because of the stagnant level of Egyptian imports.

Even though U.S. firms have not aggressively pursued the Egyptian market, a key problem is the inward-looking policy environment and the failure of the Egyptian economy to generate effective demand (and to earn the foreign exchange necessary) for an increase in imports. Thus lack of strong marketing by U.S. firms and a weak Egyptian economy are the main reasons why U.S. firms have not done well in the Egyptian market.

The Developmental Impact of Capital Projects

A.I.D.'s emphasis on capital projects derives in part from theoretical views of the development process formulated in the 1950s and 1960s. The justifications for infrastructure project assistance are essentially threefold:

- A certain minimum level of infrastructure is a precondition to the transformation of subsistence economies to market economies

- Infrastructure generates external economies, providing a stimulus to production in other sectors
- The presence of scale economies associated with many infrastructure activities implies that they require large-scale investments to be economically viable, and in many developing countries, such investments are likely to require official donor assistance rather than be mobilized entirely locally or attract sufficient private foreign investment.

The issue of a capital project's contribution to development is central to this assessment. The *Capital Projects: Literature Review and Supplier Survey* found general agreement in both the development and academic community concerning the developmental value of capital projects. They all recognize the necessity of basic infrastructure if there is to be economic development.

This assessment of A.I.D.'s experience with capital projects in Egypt was designed in part to determine to what extent and under what conditions capital projects contribute to development. The analysis of developmental impact focuses on the following topics: private sector expansion, economic rates of return, poverty alleviation and basic human needs, and institutional development and sustainability.

Private Sector Expansion

The contribution of capital projects to economic development is well documented in the academic literature. It is recognized and accepted that a basic level of infrastructure is necessary for an economy to operate and sustain its population. As stated in *Literature Review and Supplier Survey*, "There is considerable evidence that infrastructure investments, when properly designed and implemented, can help expand markets and stimulate development in other sectors."

The findings of this assessment support those conclusions. The capital projects in Egypt were designed around priority development needs through careful sector analyses. And the program, begun in the mid-1970s, has been instrumental in creating a basic level of infrastructure that is needed to support Egypt's economy.

Basic services, such as water and sewers, were initially targeted to overcome bottlenecks. Water and wastewater projects have proven instrumental in providing essential services to the domestic and commercial sectors in both

Cairo and Alexandria. These improvements represent important contributions to improved public health and support commercial and business operations that had previously worked under a very constrained environment.

Alexandria's ineffective sewerage collection and treatment systems were detrimental to maintaining urban sanitary conditions and created a bottleneck for commercial activities. The A.I.D. sewerage project helped dramatically reduce sewage flooding in the streets, allowing transportation to flow through the busy port of Alexandria and commerce to prosper.

Although private industry is small in Egypt, it cannot function effectively or even expand without adequate water, sewers, electrical power, and telecommunications. A.I.D.'s contribution to building the infrastructure necessary to support a competitive private sector should be considered key to supporting the Agency's private-sector-led-growth strategy in Egypt. (Box 2 provides an example of the importance of a properly functioning infrastructure system to a private firm's operation).

A.I.D.'s electrical power projects have contributed to providing an essential service necessary for industry and commerce to work more efficiently and effectively. An example of power's contribution to the private sector is provided by the tourism industry. The consistent supply of power in Egypt's major cities and resort sites has been one of several factors supporting the rapid growth of tourism. At \$2 to \$3 billion a year, tourism is Egypt's largest source of foreign exchange, supports a large employment base, and provides markets for Egyptian products.

Other sectors have also benefited from a reliable power supply. Agricultural irrigation pumping depends on electricity. And as mentioned above, a reliable electrical supply has also contributed to the expansion of commerce and manufacturing.

A.I.D. has also substantially modernized and expanded Egypt's telecommunications system. A modern, efficient telecommunications network is a crucial component of the economic infrastructure necessary to foster development and growth. Over the last 10 years, A.I.D. has been a major contributor to development in this sector, which has, in turn, supported industry, commerce, tourism, and finance.

Egyptian private firms benefited in important ways from their experience in helping implement the A.I.D. capital projects. The A.I.D. projects helped by

- Contributing to the private sector's exposure to and use of new technology and quality control techniques
- Teaching local engineers and technicians critical practices regarding operations and maintenance procedures
- Introducing modern business management skills

Box 2. Egyptian Private Sector Growth

Hassan Yousuf is a prominent Egyptian businessman. Since 1970, he has run a successful garment factory on the outskirts of Cairo, producing cloth and shirts. Mr. Yousuf uses Egyptian cotton for weaving his cloth but must import a variety of items to manufacture his garments. About half of his output is sold on the domestic market and half is exported to Europe and the United States. The success of his business is very dependent on Egypt's commercial infrastructure such as ports, telecommunications, electricity, and roads.

Mr. Yousuf remembers the time, not so long ago, when he had to send a messenger across town—even to Alexandria—to deliver important messages. Now, he is able to pick up the phone and place calls or send a FAX instantly anywhere in the World. Egypt's improved telecommunications system has been an invaluable asset to the success of his business.

Mr. Yousuf's standby electrical generator recently broke down. He had purchased the generator in the early 1970s when there were frequent electrical power outages and brown-outs (weaving and sewing operations require a dependable electricity supply). Mr. Yousuf is contemplating not fixing or replacing his generator, since power outages are now not as frequent and he wonders whether he really needs to spend his money on emergency power backup.

Mr. Yousuf also recently ran into a bit of good luck. His business was growing steadily and he was thinking about hiring a senior manager. Through a business acquaintance, Mr. Yousuf met an Egyptian who had managed an A.I.D.-funded program in Cairo, where he had developed a wide range of technical and business skills by working with the expatriates on the project. Mr. Yousuf now has a new senior manager for his garment factory.

- Showing, through example and training situations, an attitude of professionalism that had been lacking
- Contributing to direct spin-off effects of training large numbers of government utility staff who have moved into the private sector to establish their own businesses

A vice president of a large U.S. firm in Egypt also felt that his company had had a significant positive impact on the domestic private sector. To keep costs low and competitive, his company used the local market as much as possible. By demanding high quality standards from the Egyptian private sector, he had seen some of these firms begin to compete internationally. He also knew of two large Egyptian firms that had opened offices in the United States because of the volume of equipment orders they had subsequently received from U.S. enterprises.

Conclusions: Over the last 15 years, A.I.D.-financed capital projects have increased the level of infrastructure needed for the Egyptian private sector to expand.

Economic Rates of Return

This section provides a brief synopsis of the economic analysis undertaken for this assessment. The full analysis and data are contained in Hanrahan et al. (1994).

What Is an Economic Rate of Return? A project's rate of return is much like a yield on a bond; it is a way of expressing the net benefit of an investment. An example might make the issue clearer. If the total capital investment in a project is \$100 and the project has yearly operating revenues of \$40 and yearly operating expenses of \$20, then the net return is \$20. Assuming these revenues and expenses continue every year, the project has a net internal rate of return of 20 percent. The internal rate of return is the principal measure of a project's efficiency or net benefit.

A manager is interested in knowing what the internal rate of return will be on an investment. In addition to searching for the highest rate, he can compare rates between alternative investments and compare rates of return to the firm's cost of capital. Evaluators use rates of return to measure the economic efficiency of completed projects.

A firm deals in the market place and is interested in the rate of return at market prices. However, in Egypt, as in many developing countries, taxes, subsidies, price controls, and regulations distort prices. There are also nonmarket externalities that have a value but are not priced by the marketplace. An analysis of a project using distorted prices would yield misleading results in terms of net returns to the economy as opposed to the individual firm. An economic analysis takes the distorted market prices and reprices them using shadow prices or competitive market prices. Economic rate of return analysis is based on those competitive prices and thus reflects the "real" economic costs/benefits to the economy. In developing countries economists generally expect projects to generate an economic rate of return of 20 to 25 percent. A minimally acceptable rate would be in the range of 10 to 15 percent. This is based on the assumption that the funds invested in the project, if invested elsewhere, could at a minimum have earned a net return of 10 to 15 percent.

Economic Rate of Return Methodology. The period of analysis covered the total life of each project, beginning when the first capital costs were disbursed and ending 25 years after the last capital costs were disbursed. To analyze the nine capital projects, the first step was to calculate a financial rate of return based on market prices. The next step was to analyze distortions in market prices in order to convert financial prices to economic prices. Some of the major distortions, and the corrections for the economic rate of return analysis, included

- The price of fuel (oil and natural gas) for electrical power generation was subsidized and substantially below international prices. Fuel costs were repriced based on the export value of oil.
- Local construction costs were adjusted, based on World Bank indexes for Egypt, to remove government subsidies.
- The demand for electricity was calculated based on the price elasticity of demand for electrical power.
- Subsidized telecommunications charges were repriced based on average rates charged in 21 countries in the Middle East and North Africa.
- Indirect costs of the national utility systems (directly related to project operations) were included as project costs.
- The free market foreign exchange rate was used in place of the overvalued official rate.

- Inflation between 1977 and 1992 was removed so that all prices were stated in 1992 values.
- Government subsidies were removed from all utility operations and maintenance costs.
- Government taxes were removed from all cost categories.

Table 1 illustrates the economic rate of return for selected A.I.D.-financed capital projects in Egypt. The economic rate of return of a project in each of the sectors is discussed below.

Electrical Generation Projects. Economic analyses of the Helwan/Talkha and Shoubrah electrical generation projects demonstrate that the projects were not economically efficient investments. Helwan/Talkha has an economic rate of return of -5.2 percent and Shoubrah an economic rate of 6.8 percent. Government control of utility output prices has meant that electricity rates have been pegged at levels well below the cost of production. The Egyptian Electricity Authority has not been able to recover the long-run marginal cost of producing power. Cheap electricity rates have encouraged over consumption and inefficient electricity uses, including investments in uneconomical energy-intensive industries that generate additional economic losses elsewhere in the Egyptian economy. This rapid growth in demand for electricity has meant that even more money had to be invested in electrical power projects that yielded a low rate of return.

In the last 2 years the Government of Egypt has started to increase electricity rates, and it is assumed that they will move toward full-cost recovery. However, even with that assumption included in the economic rate of return estimates, the economic rates of return (-5.2 percent and 6.8 percent) indicate that the projects were not very good investments. Even if project benefits proved to be 20 percent greater, the projects still were not attractive investments. On the other hand, if in future years the government fails to increase electricity rates to fully recover costs, the projects become extremely bad investments (economic rate of returns of -11.8 percent and 0.3 percent).

The third electricity project, Talkha Combined-Cycle Addition, is quite different from Helwan/Talkha and Shoubrah. The Talkha Addition was built more recently, so it benefited greatly from the electricity price reforms that were initiated just as the project began commercial operation. Talkha Combined-Cycle also benefited from a technological advance—it used the waste heat from the exhaust stack of another generator. Since it does not require any fuel to generate electricity, the cost of production is very low. The project's economic rate of

return is 17 percent, clearly passing the minimum rate threshold of 10-15 percent and the project is economically sound. Even if electric rates do not continue to increase, the project is still viable with an economic rate of return of 12.6 percent. If project benefits increase by 20 percent, the economic rate of return increases to 19.5 percent.

Table 1. Economic Rates of Return
For Selected A.I.D.-Financed Capital Projects in Egypt

CAPITAL PROJECTS	A.I.D. Funding \$ Millions	ERR %	ERR Sensitivity	
			High Est. ^a	Low Est. ^b
ELECTRICAL POWER	395.3	6.4	9.1	0.3
Helwan/Talkha	67.3	-5.2	-2.9	-11.8
Shoubrah	263.0	6.8	9.6	0.3
Talkha Com/Cycle	65.0	17.0	19.5	12.6
TELECOMMUNICA- TIONS	282.0	12.0	17.1	9.7
Telcom I	40.0	11.0	15.8	9.0
Telcom II	80.0	11.0	15.8	9.0
Telcom III	122.0	11.0	15.8	9.0
Telcom IV	40.0	18.0	25.0	14.0
CAIRO WATER I	97.3	NA ^c		
CAIRO WASTEWATER II	669.3	NA ^c		

Note: EER is economic rate of return.

^aThe high estimate for power and telecommunications assumes that project benefits prove to be 20 percent greater than expected. The "best estimate" for power (third column) assumes that rate reforms continue as planned.

^bThe low estimate for power projects assumes no further price reforms (the promised future electrical power rate increases do not take place). For telecommunications projects, the low estimate assumes that indirect capital costs (systemwide costs attributable to the projects) are 20 percent higher than expected.

^cThe main economic benefits from clean water and sewage treatment are reductions in disease and deaths. However, quantifying those health benefits for the economic analysis proved difficult and an economic rate of return could not be calculated. Another approach to determining economic rate of return is calculating users' willingness to pay. To achieve a minimum acceptable rate of return of 10 percent, each Egyptian household that directly received piped water and used sewers would have had to be willing to pay \$38 per year for water and \$139 per year for sewers. If indirect beneficiaries are included, willingness-to-pay amounts are even higher.

Telecommunications Projects. Telcom I, II, and III were obligated sequentially in 1978, 1979, and 1980. Telcom IV was obligated in 1988. Since the first three projects were implemented during the same time period, they are combined together in the economic rate of return analysis. Telcom IV was implemented almost 10 years later, in a different economic policy environment, so it is analyzed separately.

The economic rates of return for Telcom I, II, and III are 11 percent. Telcom IV has an economic rate of return of 18 percent. The telecommunications sector in Egypt generates about 80 percent of its benefits from international calls that are charged at international rates without price controls. In addition, during the last 5 years, the telecommunications sector has made real progress on tariff reforms. Telephone tariffs are up and charges for the installation of new telephone lines have increased dramatically. Since Telcom IV was implemented most recently, it has greatly benefited from the increased tariffs.

Sensitivity analysis shows that if benefits are 20 percent higher, the economic rate of return increases from 11 to 15.8 percent for Telcom I, II, and III and from 18 to 25 percent for Telcom IV. If indirect system capital costs increase by 20 percent the economic rate of return drops to 9 percent and 14 percent, respectively.

Water and Wastewater. A piped water supply provides a convenient source of drinking water and water for washing, laundry, cleaning, and bathing. Much of the convenience is due to time-savings since water does not have to be collected and hauled long distances. Sewers provide a similar convenience to consumers. Often more important than convenience are the health benefits of proper water and sewerage facilities.

A number of international studies have demonstrated that improvements in water supply and sanitation can substantially reduce rates of disease, death from and severity of diarrhea cases, ascariasis, schistosomiasis, and trachoma. While clean water and sewers help prevent disease, other factors can also affect disease rates: for example, diet, health facilities, especially basic preventive health services; education; and income. Researchers have found it nearly impossible to separate individual factors, such as clean water; exclude other health influences; link clean water to reductions in specific diseases; and then give a monetary value to the reduction in specific diseases due to clean water. A standard approach to this problem is to determine the least cost at which a desired level of service can be provided. If the cost appears reasonable, in comparison to per capita income and disease rates in similar countries, then it is judged appropriate.

For the Cairo Water and Wastewater Projects two sets of data were calculated: (1) the capital and operating costs of each project and (2) the number of households benefiting directly or indirectly from the project. To achieve an economic rate of return of 10 percent, households connected to piped water would have to pay \$38 per year. Those with a sewer connection would have to pay an additional \$139 per year for the sewer. These yearly rates reflect the cost of delivering the water and sewage services, while generating an economic rate of return of 10 percent on the project. A next step⁵ would be to determine whether these rates are reasonable in relation to Egypt's per capita income level, other factors affecting health, and the disease and death rates inside (and outside) the project areas. To answer such questions, a more exhaustive study would be required. In the absence of such a study, any judgment would only be a guess. However, an educated guess can be made based on Egypt's level of development and conditions in comparable countries. For a family of 6+ persons, \$38 per year seems like a reasonable measure of benefit for clean, piped water. For sewers, \$139 per year might be excessive. However, to give a definitive answer, more research is needed.

Poverty Alleviation and Basic Human Needs

Basic human needs, by definition, refer to the most essential of needs: food, water, shelter, health, and education. Certain types of infrastructure, such as the A.I.D. water and sewerage treatment plants, clearly meet basic human needs. The reduction in waterborne disease, improved hygiene, cleanliness, and other benefits from improved water and sewage services have met a critical health need. While a number of factors affect health, clean water and sewage treatment are essential to any effort to improve health conditions. Diarrheal diseases (often a result of contaminated water and poor sanitation) are a leading cause of sickness and death among infants and children. During the 10-year period 1977 to 1987, Egypt's diarrhea-related death rate for infants dropped from 48 to 26 per 1,000 live births, nearly a 50 percent reduction. During the same period diarrhea-related deaths for children ages 1-4 years dropped from 9 per 1,000 to 3 per 1,000, a two-thirds reduction.

Under the Cairo Water I project, the enlargement of the Rod El Faraq Water Treatment Plant provided a much greater area of the city with safe potable water, as well as an increased supply of clean water to all customers. Access to increased amounts of potable water has been shown to prevent both water borne and water washed diseases.

⁵These rates are slightly higher if indirect beneficiaries are included.

When fully completed, both wastewater projects are expected to markedly contribute to the health of the residents of Cairo and Alexandria by eliminating most of the raw sewage street flooding that was common in several parts of both cities. Water-borne human wastes are clearly implicated in the transmission of diseases, such as infectious hepatitis, typhoid, and paratyphoid. The elimination of regular sewage flooding in the streets must be considered as a direct contribution to the health needs of the citizens of both cities.

In light of the existing health and sanitation conditions in Egypt in the late 1970s, the contributions of A.I.D.'s water and sewerage projects are notable. The services provided under these projects play a critical role in supporting the country's goal of addressing the basic needs of its population.

Both power and telecommunications provide the necessary tools for an economy to function effectively but their contribution to poverty reduction and basic human needs is much more indirect. Power and telecommunications have supported commercial and industrial development. The ability of industry to expand as a result of these services has provided employment for a rapidly increasing population.

Power also supports the pumping of urban water, wastewater, and agricultural water. The traditional subsistence society made few demands for pumped water; the use of human- or gravity-powered water systems was sufficient. Today, the country has enormous demands for power to support basic services such as water pumping stations, irrigation pumps, and sewage treatment plants. The supply of power to Egypt's urban and rural communities has efficiently and effectively provided irrigation and drinking water to much of the country's population.

Conclusions: In the water and sewage sector basic human needs effects are clear, though too difficult to accurately measure. In the power and telecommunications sectors, some basic needs are met indirectly (e.g., through use of electricity to pump drinking water).

Institutional Development and Sustainability

The issue of effective management, operations, and maintenance is complex—one that all the A.I.D. projects surveyed considered central to achieving sustainable utility operations in Egypt. The issue is therefore key for the USAID Mission, the Government of Egypt, and other financing institutions. If the A.I.D. projects do not continue to operate well after U.S. support ends, Egypt will face a continuous drain on its resources, which it will be using to

replace or rebuild these projects. Because the projects have had significant positive impacts on their respective sectors and have been successful in relieving other sector bottlenecks, the possible deterioration of these efforts is of great concern.

During interviews, key informants were asked a number of questions pertaining directly to sustainability. Typical of these were: Will management provide the necessary support? Will funding be available? Is the staff adequately trained and motivated? and What is the organization's history in maintaining capital intensive projects?

The questions were designed to examine many different aspects of sustainability and institutional development. The discussion below probes these aspects and their relation to the sectors examined.

Sustainability Problems

- *Organization.* The utilities' implementing A.I.D. capital projects all appear to be suffering from cumbersome organizational structures. Officials noted difficulty in obtaining even the smallest items to run a plant (e.g., office supplies, computer paper, and basic tools). An unwieldy set of procedures and steps was required to perform any task.
- *Maintenance and Performance.* No relation could be found between plant operation and employee recognition. There did not appear to be a periodic review of plant performance indicators or of rewards given for good performance. Obviously, without such feedback, the maintenance ethic would be difficult to enforce. Again, impressions given varied greatly from one respondent to another and from facility to facility. But even this variation illustrates that a uniform preventive maintenance ethic is lacking within a specific agency or across all the government agencies responsible for Egypt's basic infrastructure.
- *Personnel.* Problems of overstaffing (often 2 to 4 times the number of workers needed) and low salaries were evident at all the projects visited. The two-edged problem of overstaffing coupled with trained people leaving for better paying private sector jobs was commonly noted. As yet, the utility companies have not been able to resolve these issues. Some of the options mentioned were greater autonomy and even privatization. The competence and commitment of individual plant operators are also important. Yet, with the low salary struc-

- ture it is difficult to keep highly qualified and trained people in their positions.
- *Leadership.* The continued operation of the power plants, telecommunication system, and water/sanitation system is directly related to the preventive maintenance ethic supported by top management. In many plants management leadership and plant maintenance were very good. But in the poorly run plants indifferent top management was often blamed. In these plants management guidance was often inadequate to encourage and motivate employees. The uneven quality of management leadership is a cause for concern.
 - *Financial.* Adequate funding is one of the most critical elements of sustainable projects. In many instances, U.S.-provided spare parts from the original project were still in use years after A.I.D. funding had ended. Beyond the donor-funded spares, the Government of Egypt budget process and management system did not provide adequate support. Part of the problem goes back to the policy of underpricing the service. If the agencies were allowed full cost recovery and had some ability to control their own budgets, the issue of financial sustainability might be resolvable.
 - *Training.* Training programs varied widely within and between agencies with different levels of effectiveness. And implementing agencies uniformly considered them to be important. Training programs have emphasized both on-the-job and long-term training; most utilities now have some form of training department with on-site trainers to conduct classes. A good example of an effective training program is the Egypt Electricity Authority's program at the Shoubrah power plant. The impact of the training seems to have been transferred to other power plants but not as rigorously. At the level of the electrical distribution company, training is less formal, less intensive, and attendance at training sessions is not as well enforced.

In general, training programs do not seem to be institutionalized. Manuals are not always provided in Arabic and there is no incentive structure to encourage employees to attend training courses. The continuation of these programs without A.I.D. assistance is questionable.

- *Operations.* Utility agency management is responsible for the technical capability and quality of its plant operations. It is at this level that the agencies have been most successful. The individuals responsible

for operations appear to be competent, well trained, and proud of their efforts. The pride of the managers at all agencies was obvious. Most had been trained in the United States and endeavored to teach their fellow engineers the correct techniques. At some plants managers have personally translated manuals into Arabic. Although such efforts are a sign of the managers' personal commitment, they also are an indication of inadequate agencywide support since similar translations are not available for the whole agency.

Again, the degree of competence among operational managers, both as perceived by respondents and sampled by perusal visits, varied from plant to plant. The focus of future A.I.D. efforts should be to encourage the respective agencies to recognize, reward, and retain the individuals with the highest commitment and competence.

Outstanding Issues

A.I.D.'s capital projects have the potential to be sustainable. Many of the elements of this viability exist but are not uniformly present or consistently applied throughout the sectors. For example, even in one of the better run Egyptian utilities—the Egypt Electricity Authority—the ethic of preventive maintenance and training is accepted and practiced, yet funding for spare parts, normal replacement parts, and tools is lacking. Training quality varies greatly among the power plants, and there appears to be no policy requiring periodic recertification of operators and technicians; performance indicators are not uniformly applied; and salaries and incentives do not reflect performance, especially at the lower levels.

The potential for sustainability exists in Egypt's public sector infrastructure programs, and all of the utilities examined are working to make organizational changes. However, a number of outstanding issues must be addressed for this to occur: financial resources and autonomy, standardized technical procedures, training and employee compensation, and improved operations and maintenance procedures. (See Box 3 for an example of a typical sustainability issue in a fairly efficient treatment plant.)

1. *Financial resources and autonomy.* All of the utility operations in Egypt are run by public sector agencies and are directly accountable to the Central Government. Their budgets are dependent on government allocations and revenues earned by the utilities must be returned to government coffers. This practice impedes the project's potential for viability. Currently, utilities are not allowed to raise tariffs to adequate levels and do not receive sufficient

funding from the Government of Egypt that would allow them to cover their costs. The political sensitivity of raising rates has thwarted true cost recovery.

Box 3. Institutional Development and Sustainability

One of the best run water treatment plants in Egypt is not operated by a computer system but by seasoned engineers and technicians. Interesting to the visitor is the fact that plant does not use its laboratory to systematically check water quality or levels of chlorine and does not regularly use the donor-funded computer system to check for emergency failures and line breaks.

What keeps the plant running smoothly is a group of people who have operated the plant for so many years that they know exactly what to do—they have developed a "feel" for the operation. Every day they maintain the same levels of chemicals in the water; every day they do some basic maintenance; and every day the system continues to operate fairly efficiently.

The question arises, however: What if key people left the plant? Would the system still be viable? What if there was an emergency breakdown or failure? It is questionable that adequate systems are in place to properly address some of these issues.

This situation is typical of many Egyptian institutions. The country has many facilities that are adequately operated; however, their longer run sustainability is questionable. The problems of a lack of systemized training and inadequate maintenance are critical issues that need additional attention if Egypt's infrastructure facilities are to continue to function effectively.

A utility's personnel and operating practices are also mandated by the Government of Egypt. This practice has meant a totally inadequate salary structure and extreme overstaffing. Autonomy to raise rates or adequate funding from the Central Government will be critical for achieving sustainable utility operations in Egypt. Financial independence will allow agencies to raise tariffs to a level at which they can recover their costs and maintain a budget that can provide for spare parts, training, adequate salaries, future expansion needs, and

depreciation allowances. Without operational autonomy and cost recovery, the long-term effective operation of Egypt's public utilities is in question.

2. *Technical efficiency and operations maintenance.* Most of the utilities in Egypt are operated on a limited operational budget. Although most plants visited were operating adequately, the constraints to maintaining and operating these facilities were not conducive to sustainability.

The maintenance approaches taken at the various utilities differed widely. For example, whereas operators at the Electric Authority try within budgetary constraints to perform preventive maintenance, technicians at the plants take the approach that if equipment is operating satisfactorily, no maintenance or periodic overhaul is necessary. Both practices—that of limiting budgets and the tactic of letting equipment break before it is repaired—lead to operation and systemwide inefficiencies. To complicate this scenario many facilities lacked technical support for provision of spare parts and equipment.

Uniform and effective operations and maintenance practices still do not seem to be generally practiced by Egypt's utilities, which threatens sustainable operations. If operations and maintenance systems are not in place, the completion of the various on going A.I.D. capital projects may have serious implications for the ability of the public agencies to operate and maintain the projects in the decades to come.

3. *Training and employee compensation.* Training practices among the Government of Egypt's utility sectors vary widely, between sectors and from plant to plant. The Egypt Electrical Authority, for example, carries out highly formal, intensive training sessions at Shoubrah power plant with periodic recertification of some operators. This policy does not seem to be uniformly enforced at all power plants.

At the telephone company ARENTO, there was little formal training; on the job training was more the norm. There were wide disparities noted between the Cairo and Alexandria systems. The water and wastewater sector was still largely dependent on U.S. consultants and U.S. funding. When this funding ceases, no one can predict the sustainability of training efforts.

Even with adequate training, highly skilled employees have little incentive to stay with their respective utilities. Respondents in both the public and private sectors noted that salary levels in the private sector were three to four times higher than in the public sector. If an employee goes to work in another country, he can usually command a salary up to 10 times higher than his government salary. The discrepancy in salary levels have resulted in high employee turnover

and an inability to retain a trained work force. This issue has often been emphasized in the past; this assessment's findings only restates the problem.

As with training, performance indicators are not uniformly used to monitor past performance or to provide incentives to the operators to perform better. Performance indicators must be developed for each utility sector and each agency. Periodic management review of these indicators is needed and on the basis of these indicators, corrective action or rewards should be provided. Training and employment incentive practices remain a critical issue in Egypt's facility operations.

Conclusions: The evaluation found that most of the projects were operating very well but several factors threatened future project sustainability. The Government of Egypt and operating agencies are aware of the sustainability issues and problems cited above. What is unclear is the degree to which they understand the gravity of the problems and issues cited. Strong conditionality concerning financial sustainability, autonomy, technical efficiency, and standard operation and maintenance practices need to continue to be included in future projects and enforced by A.I.D. Without these changes the sustainability of the A.I.D.-supported capital projects remain in jeopardy.

Conclusions on Development

A.I.D. and the Government of Egypt should be looking for the best development investments. In theory, all potential projects and programs should be ranked by their economic rate of return and those with the highest rate funded first. Those ranked lower would be funded next, and so on, until the funding is exhausted. It would make no difference whether a project or program was a capital project, technical assistance, CIP, or a Cash Transfer. Those that made the greatest contribution to development would be funded.

In the case of Egypt, it was clear that inadequate infrastructure⁶ was one of several factors holding back economic development: A grossly inadequate water and sewerage system posed a health hazard and restricted commercial,

⁶It could also be said that the failure of the Egyptian Government to charge enough for electricity, telephone, and water prevented the relevant institutions from generating enough revenues to finance improved and expanded services on their own. With cheap utility rates, consumers and businesses "overconsumed" water, electricity, and telecommunications services. In effect the A.I.D. investment subsidized consumers.

industrial, and tourist development; an undependable electrical system meant that industry often had to shut down and firms found it difficult to plan their production; lack of a reliable telecommunications system forced business and industry to operate inefficiently, depending on messengers and face-to-face meetings. *Critical investments by A.I.D. generated important benefits, but the benefits could have been much greater if the policy environment had not been so distorted.*

Impact of Capital Projects on Policy Reform⁷

Capital assistance finances the "hardware" for a project, but there are nonhardware factors that affect project success, for example, price controls, subsidies, cost recovery, maintenance practices, and training. These financial and management factors are usually the focus of A.I.D. policy reform efforts.

For policy reform to succeed the host government must recognize the importance of needed reforms (ownership) and then be willing and able to take the necessary action to make the reforms stick (power). A technical ministry or state-owned utility may be committed to reforms (ownership), but it might lack the clout (power) to carry out the reforms. There are usually stakeholders and special interests that are harmed by change, both inside and outside the government. Quite often the power or muscle to push through a change lies with the Ministry of Finance since it sets many of the financial policies and guidelines and provides subsidies to the operating ministry. If policy reform "ownership" and "power" are in separate ministries, policy reform that focuses on just the operating ministry may not succeed since the power or muscle lies elsewhere. If the Ministry of Commerce, or Foreign Affairs, or Office of the Presidency also control some of the power and regulatory levers, the task becomes even more difficult. In addition to the problems on the host government side there can also be problems on the U.S. Government side if A.I.D. policy concerns are not shared by the Department of State.

Since political and military concerns have dominated U.S. interests in Egypt, it has often been difficult for A.I.D. to stand firm on tough economic policy reforms. Restored U.S. economic aid in 1974 was a peace dividend for the end of the Egyptian-Israeli hostilities. In the years that followed, aid levels were earmarked by Congress and had to be completely obligated by the end of each fiscal year.

⁷See Appendix F for more detailed analysis of this topic.

In theory, once funds were obligated, disbursements could be held up if conditionality was not met. However, since both the Government of Egypt and the State Department have viewed the Egypt aid program as largely an entitlement, it has been difficult for A.I.D. to stand firm on policy conditionality. With limited room for policy reform conditionality that could block aid disbursements, the overall effectiveness of A.I.D. policy reform efforts has been significantly constrained, giving way to U.S. geopolitical considerations. A brief summary of A.I.D. policy reform efforts in the sectors examined follows.

A.I.D. Electrical Power Projects

Project policy conditionality focused on (1) reducing the Egyptian Electric Authority's debt to equity ratio, (2) improving the rate of return on the Authority's fixed assets, and (3) increasing electric power tariffs to cover all generation and distribution costs.

The A.I.D. Egypt FY 1990 Action Plan (March 1989) review of electric pricing policy reform pointed to very limited success with project-supported sector policy reform. Egyptian electricity prices in 1989 represented less than one-fourth of the real economic cost of electricity. These subsidized prices have encouraged excessive consumption by inefficient factories producing energy-intensive products that often cost two or three times the international price of similar goods. A.I.D. and other donors, including the World Bank, have consistently urged the Government of Egypt to substantially increase energy prices. Both A.I.D. and the World Bank have followed a policy of relating funding levels for electricity generation projects to progress on adjustment of electricity rates toward more realistic levels. These efforts met with limited success. Over the 1980s, energy rates did not keep up with inflation, thus, real energy prices declined.

The World Bank was even more blunt in its assessment of the failure of policy reform in four Bank projects in the Egyptian power sector (Egypt: Kureimat Power Project, R92-18, 1992). The Bank concluded that in Egypt "it is unrealistic to use project lending to achieve energy pricing reforms, as such reforms have broad cross-sectoral impact."

By 1987 both A.I.D. and the World Bank terminated assistance to the electrical generation sector. Sector project support was resumed in 1989 when the Government of Egypt adopted a comprehensive macro reform program that included energy price reforms. While the IMF took the lead with its negotiation of a Stand-By, the World Bank's Structural Adjustment Agreement and A.I.D.

Cash Transfers strongly supported the reform program. The reforms of 1989 have continued with additional reforms in 1990-1993.

Telecommunications Projects

A.I.D.'s telecommunications program started with Telcom I, in 1978. Policy conditions were designed to improve the telephone company ARENTO's operations by organizing it into a commercial operation, rather than a government department, and taking steps to make it financially viable. The policy reform conditions included the following:

1. *Financial viability.* ARENTO was to establish a tariff rate structure for the 1980-1985 period that would generate enough revenue to cover the costs of future operations, service local and foreign debt, and provide an acceptable contribution to capital investment.

2. *Commercial independence.* To make ARENTO an autonomous entity, not a part of a government ministry, a number of organizational measures were to be instituted to ensure ARENTO's financial and management independence.

The policy reforms reflected the need to put the telecommunications system on a commercial basis, rather than treating it as a government operating department. The policy conditionality of Telcom I (FY 1978) was not achieved, so it appeared in Telcom II (FY 1979). The conditions were still not met, so they appeared again in Telcom III (FY 1979). Not until 4 years after Telcom I, with the amendment of Telcom III (FY 1982), was any progress made on the reforms.

ARENTO has finally become an autonomous entity, but it still reports to the Ministry of Communications. A new tariff rate structure was approved in 1982, but the rates were not increased to a level that would cover all costs. It was termed an "intermediate adjustment." ARENTO's employment levels declined by 4 percent, though they increased in later years. Some progress was made in collecting telephone bills owed by government ministries, but the military and Ministry of Interior still had substantial outstanding bills.

Several factors stand out:

- The policy reforms represented a reasonable way to improve the financial and institutional viability of ARENTO.

- The reforms were not met with the first three telecommunications projects.
- It took 4 years after the original Telcom project to achieve some limited reform results and several more years to achieve further reforms.
- A.I.D. put \$200 million into the telecommunications sector before achieving any significant progress on policy reform conditionality.
- At the time of the evaluation the telecommunications sector had implemented most of the reforms; operations and maintenance costs are now covered by revenues and plans are in place to move to full cost recovery.
- Telecommunications is now one of the most viable sectors in the economy; however, it took a long time to reach this point.

Water Sector Projects

Policy reforms included in the 1977 Cairo Water System Project were as follows: (1) a tariff plan designed to generate adequate revenues to cover, at a minimum, operations and maintenance expenses and debt service; (2) a plan to improve meter installation, reading, and repair, along with improved bill collections; and (3) a plan to reduce water wastage.

Only by 1989, at the end of the 12-year project, were water revenue goals close to achievement. The USAID/Egypt FY 1990 Action Plan found that user charges in 1986 represented only 40 percent of recurrent costs. By 1989, revenues were close to covering operations and maintenance and debt-service costs and it was expected that these costs could be fully covered in 1991. However, it was noted that meeting this objective could be jeopardized by the large volume of water lost to leaks and theft and the substantial nonpayment of bills.

The Wastewater Sector

Sewerage projects are characterized by significant "externalities" due to their positive impact on health and the environment, for which it is not feasible to charge through tariffs. Hence, it is difficult to collect user fees that cover the full costs of sewer services.

Sewage sector reforms were included in the 1984 Cairo Sewage II Project and its 1986 second amendment. The reforms addressed the need to increase revenue and to improve operations. Many of the operational reforms have been put in place. Progress in meeting the revenue reforms has been slow, however. Prior to July 1, 1985 no sewerage charges were assessed; beginning on that date, a 10 percent sewer surcharge was imposed on all water users. The sewer fee only covered an estimated 10 percent of recurrent costs in 1985, which were defined to include operations and maintenance and debt service. The 10 percent charge did not increase until July 1991, when it went from 10 to 20 percent for residential connections and from 10 to 50 percent for commercial and industrial connections. However, the nominal increases in water fees (the base for the sewer surcharge) did not keep up with inflation. Also, bill collection remains a problem, with success rate estimates ranging from 40 to 90 percent. Thus, the sewerage system is far from financial viability.

Recent Changes in the Policy Environment

This evaluation examines long-term performance and results—in this case, what happened over the life of nine A.I.D. capital assistance projects. It examines the economic conditions and project objectives that existed when the projects were started and how the projects have operated up until the time of the assessment. It does not attempt to predict how the capital projects will perform in the future. Even though this is an evaluation of past performance, it is important to note some recent changes that might alter future project performance.

During the 1970s and early 1980s, Egypt enjoyed an annual gross national product growth rate of more than 7 percent, due primarily to favorable oil prices (oil is Egypt's primary export commodity), workers' remittances, and generous flows of foreign assistance. However, the economy was heavily dominated by the Government, with an extensive array of restrictions, controls, and subsidies. By the late 1980s, Egypt had a rapidly worsening balance of payments, economic growth was sharply down, international reserves were nearly exhausted, and the country was having difficulty meeting its debt obligations. The structural imbalances caused by government controls were strangling the economy.

Partly as a result of A.I.D.'s role, the Government of Egypt became more willing to make critical policy changes. Starting in the late 1980s, The Government began working with the IMF to stabilize the Egyptian economy. An IMF Stand-By in 1987 and Paris Club debt rescheduling provided some temporary relief, but the policy measures taken were inadequate to prevent further economic decline. A number of substantive policy reforms were developed and implemented starting in 1989. The May 1991 IMF Stand-By and October 1991 World

Bank Structural Adjustment Loan represented major actions by the Government of Egypt to eliminate subsidies and controls, to undertake privatization of the economy, and to institute major reforms in the financial and trade sectors. A number of these reforms favorably affected A.I.D.-funded capital projects.

While it is clearly too soon to judge whether these reforms will be fully implemented and long lasting, they represent a significant attempt at economic policy reform, which, if sustained, should improve performance of the economy as a whole and capital projects in particular.

Conclusions on Policy Reform

It is argued that policy and institutional constraints are often more critical than physical constraints to economic development. The World Bank's 1991 *World Development Report* suggests that *projects in an adverse policy setting are not likely to contribute significantly to development*. The *World Development Report* argues that the key to inadequate infrastructure has more to do with inefficient use of existing assets rather than the need for new assets. *During most of the last 15 years the Egyptian policy environment restricted development. Implementation of capital project conditionality was often slow and incomplete.* - It should be noted that A.I.D. had difficulties pushing for policy reform with both capital projects and other types of assistance. Progress was very slow and hesitant until the recent 1989 joint effort by A.I.D., the IMF, and the World Bank.

This assessment found that there were serious problems with policy reform in all of the capital project sectors analyzed—power, telecommunications, water, and sewers. Some of the problems may be related to the nature of capital projects, but most were related to the political context for U.S. assistance to Egypt.

The U.S.-assisted Egyptian capital projects took many years to build and required a long series of projects to fully meet the development needs in a sector (e.g., Telcom I, II, III, and IV). They were often part of an effort to improve the total system in a sector. Given the lead time on design, engineering, construction, and so on, it was difficult to stop project implementation if a policy reform did not take place. When equipment was already ordered and concrete had been poured, it was hard for A.I.D. to halt a half completed project.

A capital project represents a large fixed investment that will be productive for many years. The Government may agree to raise prices now, but what will be the case in 2 or 3 years when the rates have been increased but

rapid inflation has eroded the financial viability of the institution? Policy reforms are not a one-shot occurrence—they tend to evolve over a period of several years, with continued analysis and monitoring required as a sequence of policies are put in place to meet changing conditions. The funding of the "bricks and mortar" of a capital project tends to be concentrated in a short period of time. It is argued by some that annually funded policy-based Cash Transfers are a more flexible tool for responding to changing country conditions over a period of many years.

It would, of course, be interesting to compare and contrast capital projects to other types of assistance, to determine which form of assistance is most effective with respect to promoting policy reform. Such an effort would be no small task. In many respects it would mean answering some of the most basic development questions: What are the basic constraints to development and what form of assistance is best able to solve those constraints? This assessment was not designed to take on that large task; however, it is possible to make some general observations about capital projects and other forms of assistance.

While there were clearly problems with capital projects, in Egypt, Cash Transfers, CIPs, and other forms of assistance were not that successful in effecting policy reform either. Prior to 1989, A.I.D. faced an environment in which progress on policy and institutional reform was difficult for all forms and modes of assistance. The United States had very important political/military interests in the Middle East. The A.I.D. funds had to flow to Egypt each year: they could not be held up for development reasons. Thus, for policy reform, the political environment was more important than the form of assistance.

Do Commercial Concerns Distort Project Technology?

The capital intensive nature of infrastructure programs makes an analysis of the "appropriateness" of these projects to Egypt's economic circumstances important. The issue in this regard is whether U.S. capital goods, designed for the U.S. market, are technically and economically suitable for the Egyptian market and economy. In addition, if A.I.D. has as one objective help for U.S. exporters, the selection of equipment and technology may well be biased toward the interests of the U.S. firms, rather than Egypt's needs.

Egyptian Government officials, project managers, suppliers, and contractors were all asked direct technical questions regarding the appropriateness of various pieces of equipment, machinery, operating processes, and engineering services provided under the A.I.D. projects. All respondents made fairly strong statements that A.I.D. was implementing technologies appropriate to Egypt's

needs. Many went on to say that although Egyptian utilities often want the most advanced technologies, A.I.D. consistently resisted funding this type of equipment. Unless the consultants and technical officers on a project concur to both the necessity and appropriateness of a technology, it will not be purchased for A.I.D. projects. One very candid U.S. firm admitted that in one of its A.I.D.-funded projects, it would have chosen a more profitable technology, but A.I.D. and the Government insisted on a different technology.

Contractors and suppliers recognized the importance of supporting sustainable equipment operations. Those interviewed often noted that the simpler the equipment, the easier it was to maintain and repair; in the long run, this meant a longer life for equipment and, in turn, the functioning of the project as a whole. It was also noted that all A.I.D. projects included a substantial training component, which helped ensure that equipment would be operated effectively.

A.I.D. has made successful efforts to use appropriate technologies in Egypt. Equipment and technology are selected on the basis of Egypt's development needs, rather than on the basis of U.S. commercial interests.



APPENDIX A

FINDINGS FROM THE TELECOMMUNICATIONS SECTOR

Introduction

Why Invest in Telecommunications

At first blush, telephones seem like a useful convenience for calling people but should not be considered that essential to development. In fact, a telecommunications system is essential to economic development and telecommunications services are used mainly for business purposes. A World Bank study estimates that more than 90 percent of Egypt's systemwide calls are business related.

A telecommunications system is basic infrastructure, critical to development. A developing country, like Egypt, that wants to modernize and accelerate development has no alternative but to move into the world of computers, FAX machines, electronic data transfer, and international business communications. It must have a telecommunications system that will meet those needs.

On the microeconomic level, adequate telecommunications service improves the efficiency and productivity of private sector firms, public institutions, and agricultural producers. Telephones are generally more cost-effective than face-to-face meetings or deliveries by messengers. An efficient telecommunications system makes it possible to develop a modern business environment, efficient financial institutions tied to world markets, and a tourism industry. A modern and efficient telecommunications system is often cited as one of the key investment considerations for foreign firms.

Telephones enable market agents, particularly small- and medium- sized private enterprises, to obtain better market information, respond more rapidly to market signals, and thus make informed production and marketing decisions.

An effective telecommunications system supports cost-effective decision-making. A manager's inability to respond quickly to such inevitable production problems as machine breakdowns, parts shortages, or problems with inputs can lead to costly production stoppages. Communication difficulties often force firms to hold excessively large inventories and to incur unnecessary storage costs and other charges. Inadequate communications also imposes unnecessary distribution costs, as poor coordination between dispatchers, their drivers, and their customers can result in delivery delays.

In rural areas, local agribusiness and farmers suffer because they do not know about changes in crop prices, the arrival of buyers in nearby towns, and government-sponsored agricultural programs. Access to telephone service would enable local agribusiness firms and farmer cooperatives to find out about prices elsewhere, thus increasing their bargaining leverage.

Problem in the Late 1970s

Egypt's telephone system was antiquated and extremely congested, with a telephone line density of only 1 percent (1 telephone per 100 population). Repair attempts were often futile because the equipment was so old that cables disintegrated when touched. The country had not made any investment in modernizing its network for over 10 years. Businesses operating in Egypt were alarmed at the deterioration in telephone service and some international firms seeking an operations base in the Middle East were reluctant to establish offices in Egypt since telecommunications were so inadequate. The often repeated story of businessmen flying from Cairo to Athens to make an international phone call reflected the extent of the problem.

Telephone reception was very poor. To make a local call required many dialing attempts and sometimes the dialtone could not be obtained for hours. Lines were frequently out of order, the connection rate was only 30 to 40 percent, and disconnections amid conversations were common. At one company in Cairo, for example, an average of only 6 calls per hour could be completed during the workday on each of its lines; this rate was only the result of constant dialing and repeated attempts to obtain the desired connection. A transportation study by the Massachusetts Institute of Technology found that 30 percent of the road traffic in Cairo was due to inadequate telephone service (which is probably an excessively high estimate, but an indication of the magnitude of the problem).

The Egyptian Government's telecommunications agency, ARENTO (The Arab Republic of Egypt's National Telecommunication Organization), suffered from numerous equipment and organization and management problems.

As to equipment, problems consisted of:

- Inadequate number of telephone lines and poorly functioning switching stations
- Obsolete or poorly functioning telephones
- Faulty cable networks with many damaged connectors
- Switchboards and connecting networks in poor condition

As to organizational and management problems, ARENTO was:

- Required to hire personnel it did not need, to support government efforts to reduce unemployment.
- Unable to fire unproductive employees, with promotions based on seniority, not ability.
- Unable to hold onto good employees since ARENTO had to apply standard government pay rates.
- Required to follow standard ministry management and accounting systems that did not fit its needs.
- Required to turn over all net income to the Ministry of Finance (which prevented self-financing of operations).
- Without the technical and management skills needed to effectively plan development or upgrade performance.

A.I.D.'s Sector Strategy and Project Approach

A.I.D.'s country development strategy of improving Egypt's economic productivity and encouraging the country's private sector is directly dependent on an expanded and modernized telecommunications system. A modern, efficient telecommunications network, which fully meets demand, is a crucial component of the economic infrastructure needed to foster rapid growth and raise Egyptian living standards.

A.I.D. assistance was designed to improve Egypt's telecommunications system by strengthening the planning, management, operations, and training

functions of ARENTO, and to rehabilitate and replace components of the system in the large population centers of Cairo and Alexandria.

Project Description

Beginning in FY 1978, there were a series of four A.I.D.-funded telecommunications projects (Telcom I, II, III, and IV). The first three projects were obligated over a 3-year period: Telcom I in FY 1978 for \$40 million; Telcom II in FY 1979 for \$80 million and; Telcom III in FY 1980 for \$122 million. These three projects provided financing for (1) consultant services for installation and construction activities and for improvement of ARENTO's management operations; (2) equipment to replace 10 obsolete mechanical telephone switching systems in Cairo and Alexandria with electronically controlled analog switching systems; and (3) equipment and materials to expand and rehabilitate associated cable networks.

Telcom IV, authorized in 1988 for \$40 million, financed consultant services, the installation of state-of-the-art, electronic digital switching systems to serve three new exchanges, and the rehabilitation of the cable network. A.I.D. also provided \$62.5 million under the Commodity Import Program to finance microwave links within the country. A.I.D.'s total assistance to the telecommunications sector was \$344.5 million. In addition to the A.I.D. input, the World Bank and other bilateral donors provided over \$1 billion in telecommunications assistance.

Achievements

Telcom I, II, and III are complete and Telcom IV will be complete in FY 1994. The 10 A.I.D.-financed telephone exchanges (under Telcom I,II, and III) are operational, providing 280,000 new lines and improved service on existing lines, with about 2.1 million users in Cairo and Alexandria benefiting from the projects. Telcom IV will provide another 70,000 new lines and improve service for an additional one-half million Cairo residents. Overall, the project also improved ARENTO's management and planning capabilities. During the 10 years of project implementation (from 1980 to 1990), there were major improvements in the overall telecommunications system, such as the following:

- The number of telephone lines increased from 510,000 to 2.15 million lines and telephone density improved from 1 phone line per 100 to 4 per 100.

- The number of communities connected to the direct dial network increased from 7 to 189.
- The number of international circuits increased from 820 channels to 5,560 channels.

A rough but useful measure of access is the telephone line coverage or density (telephone lines per 100 people). It is useful to compare Egypt's ratio to the ratio in neighboring countries. Egypt's telephone density of 4 telephone lines per 100 Egyptians compares favorably: 9 in Turkey, 4 in Iran and Syria, and 3 in Tunisia and Algeria. Another measure of efficiency is the call completion rate—which measures the efficiency of the total system. The 30 to 40 percent rate of the late 1970s has been roughly doubled.

Findings

Selection of Capital Projects for A.I.D. Funding

The selection of the telecommunications sector and the design of individual projects was driven by development considerations—not U.S. commercial concerns. Telecommunications represented a key infrastructure element in support of A.I.D.'s strategy of increasing Egypt's economic efficiency while encouraging private sector-led growth.

Appropriateness of the Technology Used in the Projects

The heart of a telephone system is the switching center that routes telephone calls. An individual switch on each line directs the call to the proper line. Telcom I, II, and III provided electronic analog switches and Telcom IV provided electronic digital switches. At the time of the first three projects, electronic analog switches were state-of-the-art. By the time of Telcom IV, 8 years later, digital switches were state-of-the-art. For all four stages, the latest technology was used.

An immediate concern was whether a developing country should take the risk of leaping into a new high-tech switching technology. For many years Egypt had been using the old standard telephone technologies of rotary switches and the slightly more modern electromagnetic crossbars. In fact, Egypt had its own manufacturing plant that was producing crossbar switches.

The new electronic switching technology was rapidly becoming the standard in much of the world. Although it was more expensive, it was highly reliable, showed little wear over time (thus requiring little maintenance), required much less physical space, allowed the addition of a number of new telecommunications services, handled a much expanded call volume, and greatly improved the speed and quality of telephone connections and clarity of reception. The new technologies required much fewer people to manage and operate the system; however, they needed a higher level of technological knowledge.

Based on in-depth interviews with ARENTO personnel, equipment suppliers, and Egyptian business people (the users of the telephone system), it appeared clear that the technology was appropriate to Egypt's needs and ARENTO's ability to maintain and operate the system.

A.I.D. Telcom projects included major training elements on the operation and maintenance of the new switching technology. These training programs were highly successful. ARENTO staff were able to effectively operate and maintain the analog switches and the newer digital switches. Some of the switches had been operating for 10 years with almost no loss of performance or reliability. Today, ARENTO is able to effectively operate and maintain the system, although it still relies to some extent on outside expatriate assistance. To ensure sustainability, ARENTO needs to establish a better in-house training program.

A.I.D. Telcom projects provided training on the technical operation of the electronic switches. But probably as important was the training provided on planning and operations. The U.S. approach to management and the planning and organizing of an operation represented something new and different for ARENTO. The transfer of U.S. management skills may have been more important than the transfer of technical skills.

How do capital projects, in areas where the United States has a technical edge, contribute to development? This evaluation found that in telecommunications the international business world is highly competitive and no country has a clear technological lead. In telecommunications, several U.S. companies are in leading-edge technology, but so are companies in Germany, Japan, and France. The United States does not really have a unique technological advantage in the telecommunications field.

On the other hand, technology that was provided under the A.I.D. Telcom projects allowed Egypt to accelerate its telecommunications growth by skipping at least one or two generations of technology in moving immediately to electronic switching.

How do capital projects support additional U.S. exports, beyond the A.I.D. financed project? Before A.I.D.'s Telcom assistance, Egypt had an antiquated telephone system that barely functioned. The United States created a new phone system and in the process applied U.S. telecommunications standards and operations procedures to the Egyptian system. One would expect that the United States must have gained a strong commercial foothold in Egypt's telecommunications sector, since the United States had developed the sector and had the sector adopt U.S. standards. However, that does not seem to be the case.

Most of the follow-on spares and replacement parts for the A.I.D.-funded projects came from the A.I.D. commodity import program or from follow-on A.I.D. Telcom projects. There were only limited commercial sales (non-A.I.D. financed). AT&T, the equipment supplier under the A.I.D. telecommunications projects, sold cable, fiber optic lines, and some switches to Egypt without A.I.D. financing. These sales were to ARENTO and a few other customers. These non-A.I.D. sales are equal to 20 percent of AT&T's A.I.D.-financed sales. At 20 percent, these sales were not trivial, but also not substantial.

About 75 percent of the Egyptian market for telephone equipment is provided by imports (most financed by concessional assistance or export credits). In the area of electronic switches, which the A.I.D. telcom project pioneered, the United States is only one of many suppliers (see Table A-1).

Table A-1. Market Shares in Egypt for Switches in 1990

	<u>Percentage</u>
AT&T (U.S.)	30
Siemens (Germany)	30
Alcatel (France)	25
NEC (Japan)	10
Other	5

Source: *Global Telcom Report*, April 1992

Another important market is telecommunications equipment installed in offices and businesses. This includes telephones, PABX switchboards, FAX machines, E-mail, etc. The export shares are spread broadly among a number of different companies. The U.S. firms have a smaller share than they do for electronic switches (see Table A-2).

Table A-2. Market Shares in Egypt for Customer Premises Equipment in 1990

	Percentage
U.S. Firms	15
AT&T	5
GTE	5
Northern Telcom	5
Major Non-U.S. Firms	35
NEC	10
National	10
Alcatel	5
Siemens	5
Metel	5
All others	50

Source: *Global Telcom Report*, April 1992

The Egyptian Government in the mid-1980s decided to develop its own capacity to manufacture digital switches in-country. It looked for a foreign firm to serve as a joint partner in developing the local manufacturing plant. The U.S. firm that had provided the equipment and technical knowhow to bring electronic switching to Egypt (under the A.I.D. Telcom I, II, III, and IV projects) seemed a likely candidate. However, a German firm (Siemens) won the competition and is setting up the plant. Even a series of A.I.D.-funded capital projects was not enough of an advantage to help a U.S. firm get into local manufacturing, which may eventually replace most of the imported telephone switches.

Benefits to Egypt's Private Sector

The evaluation team found that over the last 10 years much of the growth in industry, commerce, tourism, and finance would have been very difficult, if not impossible, without an improved telecommunications system. A modern, efficient telecommunications network is a crucial component of the economic infrastructure necessary to foster development and growth. Here are a few examples of recent benefits: Federal Express was unable to provide delivery service in Egypt until the local licensor had a phone line and was able to log into

the Federal Express worldwide data network. Shortly after the A.I.D. telecommunications upgrade in 1983, Pfizer Pharmaceutical undertook a \$4 million expansion of its Egyptian manufacturing facility. Air France was able to reduce Cairo overbookings from 30 to 10 percent. Cairo hotels were able to maintain higher occupancy rates and tour agents in the United States were able to better arrange and make last minute changes in package tours. In a short span, tourism has developed into Egypt's No. 1 foreign exchange earner.

Policy Reform and Sector or Subsector Conditionality

Telcom I included policy conditions designed to improve ARENTO's operations by organizing ARENTO as a commercial operation rather than as a government department, and to take steps to make ARENTO financially viable. The policy reforms are as follows:

Financial viability. To establish a tariff rate structure for the 1980-1985 period that would generate enough revenue to cover the costs of future operations, service local and foreign debt, and prove an acceptable contribution to capital investment.

Commercial independence. To make ARENTO an autonomous entity, not a part of a government ministry. This included the following measures to ensure ARENTO's independence:

- The ability to participate in commercial joint ventures.
- The establishment of a reasonable (nonpolitical) rate structure.
- Independence from Egyptian Government employment quotas.
- The ability to hire and fire employees and establish its own wage rate structure independent of Government rules.
- The retention of ARENTO's profits for reinvestment, rather than having to turn profits over to the Ministry of Finance.
- The establishment of accounting, financial reporting, inventory control, and other systems designed to meet the needs of a telecommunications business, rather than a government department.
- The freezing employment levels.

- The assurance that Government of Egypt organizations pay their telephone bills.

The policy reforms reflected the need to put the telecommunications system on a commercial basis, rather than treating it as a government department. The policy conditionality of Telcom I (FY 1978) was not achieved, so it appeared in Telcom II (FY 1979). The conditions were still not met, so they reappeared in Telcom III (FY 1979). Not until 4 years after Telcom I, with the amendment of Telcom III (FY 1982), was any progress made on the reforms.

ARENTO finally became an autonomous entity, but it still reported to the Ministry of Communications. A new tariff rate structure was approved in 1982, but rates were not increased to a level that would cover all costs. It was termed an "intermediate adjustment." ARENTO's employment levels declined by 4 percent and some progress was made collecting telephone bills owed by Government ministries. However, the military and Ministry of Interior still had substantial outstanding bills.

Several factors stand out such as the following:

- The policy reforms represented a reasonable way to improve the financial and institutional viability of ARENTO.
- It is rather surprising that the reforms were not met with Telcom I, with then two more telecommunications projects provided.
- A.I.D. put \$200 million into the telecommunications sector without achieving any progress on policy reform conditionality.
- It took 4 years after the original Telcom I to achieve some limited policy reform results.

Leveraging other donor and private sector participation. There is no indication of the A.I.D. program bringing in other financing.

Leveraging non-U.S. financing resources and generating follow-on U.S. sales after project completion. The digital switches and much of the other equipment installed by AT&T are either proprietary or unique to AT&T. Thus, repair parts and replacements will have to be bought from AT&T. Since maintenance requirements are minimal and the A.I.D. projects included substantial funding for spares and replacements, it will be some years before there is a need for ARENTO to make purchases directly from U.S. suppliers.

Support for poverty reduction and meeting basic human needs. Telecommunications do not directly affect basic human needs.

Private Sector Benefits

Almost everyone the evaluation team interviewed, from both the private sector and government, noted that the recent development of Egypt's private sector would not have been possible without an improved telephone system. Many international firms would not have established a Cairo office if the telecommunications system had not been improved. Before the improvements, the struggling private sector had to depend on messengers and face-to-face meetings. Now, with a greatly improved telecommunications system, the private sector is able to expand and greatly improve its efficiency.

Telephones in Egypt now reach most small towns and some rural areas. Price information and deliveries are arranged by phone. In Cairo, with extreme traffic congestion, the phone system not only helps the modern sector but also small traders who can avoid travel and get the most efficient use of their delivery trucks.

Sustainability

The A.I.D. Telcom projects included a large training component and ARENTO appears dedicated to continuing the training program. ARENTO is providing good service and maintenance. The analog switches installed under Telcom I, 10 or more years ago, are well maintained and operating effectively. There are, however, problems with staff turnover, which requires a large training effort, and the fact that the U.S. supplier and engineering firm are still in-country. The real test will be once the U.S. firms depart and ARENTO is completely on its own.



APPENDIX B

FINDINGS FROM THE ELECTRICAL POWER SECTOR

Introduction

During much of the 1970s and 1980s, there were major problems with Egypt's electrical power system. Not enough electrical capacity existed, so many new firms could not count on a hook-up. With a shortage of electricity, there were frequent brown-outs and black-outs, and electrical quality was also a problem with interruptions, voltage spikes, and drops. Many firms had to invest in standby electrical generators in order to keep their plants operating.

During the past 20 years, the Government of Egypt has given high priority to the provision of electrical power to its people. All villages with a population over 1,000 now have electrical power and almost one-half of the villages of less than 1,000 also have service. From 1980/81 to 1990/91, sales in million kilowatt hours (MKWH) rose from 9,200 to 17,150 in the industrial sector; from 776 MKWH to 1,367 MKWH in agriculture; from 423 MKWH to 1,813 MKWH for commercial users; and from 3,355 MKWH to 12,060 MKWH for residential customers. Residential and commercial usage nearly quadrupled, while use in all other sectors nearly doubled.

Under the management of the Egyptian Electric Authority (EEA), power generation capacity to meet this need has grown from 3,800 megawatts in 1976 to 11,280 megawatts in 1991. Per capita consumption of electric power grew about 8 percent annually during the 1980s, and in 1991 and 1992, it grew at approximately 5 percent per year.

The high voltage 500 kilovolt transmission system reaches from the Aswan High Dam in southern Egypt to Cairo. The remainder of the country is linked by 220, 132, and 66 kilovolt transmission lines. This system is referred to as the Unified Power System (UPS). The operation of the electrical system is divided into seven electrical zones with central dispatching at the National Electrical Control Center (NECC) located near Cairo. This center dispatches all power and controls transmission loading in the UPS. Local distribution is handled by eight electricity distribution companies. These companies purchase

wholesale energy from the EEA and sell the power to residential, commercial and industrial customers who are served at medium (11 kilovolt) and low voltage (380 volts). Wholesale and retail rate structures are developed and proposed by EEA to the Cabinet and authorized by Presidential Decree.

From 1975 to 1990, A.I.D. has supported the Government of Egypt's electrical improvement efforts by providing over \$1.6 billion of assistance for the construction of power plants, transmission lines, distribution lines, training, and control centers. EEA has supplied all local currency for these facilities. U.S. assistance has contributed to the installation of 2,576 megawatts of baseload thermal generating capacity, nearly 25 percent of the total system capacity or 30 percent of the thermal capacity. In addition, U.S. assistance has supported urban electric distribution system modernization, transmission upgrades, and training. As a result, there have been substantial reductions in energy losses, fewer outages, more reliable service, and savings in fuel costs. The system has grown from a disconnected, unreliable operation to a modern, well-connected system with a central control operated by a competent work force.

However, not all aspects of the national electrical power system have improved. Energy prices historically have been heavily subsidized and only recently have begun to move toward a more realistic level. High electrical losses still exist, especially at the distribution level. Energy conservation has not been aggressively implemented due to the availability of cheap power. Cheap energy has also resulted in excessive consumption and the initiation of energy intensive industries that are not internationally competitive. These issues are and have been well known to the EEA, A.I.D., other donors, and lending institutions. A.I.D. has encouraged programs to reduce distribution network losses and has financed improvements in Alexandria. In the 1990s, A.I.D. and other donors plan to emphasize more aggressive policies to improve all these areas.

A.I.D. Strategy

A.I.D. capital projects in the Egyptian electrical power sector were motivated by a blend of political commitments and development objectives. During the past 17 years, capital intensive electrical power-related projects were conditioned on fundamental improvements being made in operation, maintenance organization, pricing, and training. All of these conditions were structured to assist the Government of Egypt in modernizing and expanding the country's electrical system infrastructure base. The strategy of the 1980s was to expand generation, enhance the efficient delivery of electrical energy and help the EEA become a self sufficient modern organization. The first two were achieved, but due to subsidized rates, the EEA still can not generate sufficient revenue to cover all of its costs. Energy prices remain below world market prices despite rate

increases. An additional problem is that bill collections have lagged, depriving the utility of revenue, despite rate increases.

Current A.I.D. power sector strategy emphasizes the following three desired outcomes:

- Improved performance of existing electric generation and distribution facilities.
- Enhanced Government of Egypt capacity for utility management.
- Improved market pricing and cost recovery.

Projects and studies to help achieve these outcomes have been undertaken. Continuing assistance will be provided to increase activities to achieve these goals and measure performance.

Project Descriptions

The Capital Projects Evaluation analyzes the following three electrical generation station projects: Shoubrah El Kheima, Talkha and Helwan, and Talkha Combined Cycle.

Shoubrah El Kheima: This power plant was designed to increase the baseload generation capacity of the EEA. The plant, located near Cairo, consists of four steam generating units totaling 1,260 megawatts. The plant, which became fully operational in 1988, is connected to the UPS by 220 kilovolt transmission lines. Performance has been excellent since the first unit came on line in 1985, and it has reliability, availability, and capacity factors comparable to similar U.S. plants. Shoubrah training facilities have also become the EEA center for teaching power plant operation and maintenance. Extensive preventative maintenance is practiced and the capability of in-house circuit board testing and spare-parts fabrication has been developed.

The project was partially funded by A.I.D.'s contribution of \$263 million. The World Bank and eight other lenders also provided financing. Construction management was provided by Overseas Bechtel with the following major U.S. suppliers:

- Westinghouse Electric Co.
- TransAmerican DeLaval Inc.
- Southwest Engineering

- Owen Steel
- Infilco Degremont Inc.

Extensive training was provided by equipment suppliers and through the Salt River Project at their Coronada Power station in Arizona. EEA operators and staff who were trained at Shoubrah are currently assisting other Middle Eastern countries at their power plants. The plant has become a model steam turbine thermal generation station for Egypt and an example for other developing countries.

Talkha and Helwan: The purpose of these two gas turbine power plants was to help alleviate demand in the cities of Talkha and Helwan and to assist in unloading the transmission lines serving these areas. A.I.D. funded \$67.3 million for the installation of a 120 megawatt gas turbine electric generating plant near Helwan and a similar plant of 180 megawatt near Talkha. Talkha went on line in late 1979 and Helwan in early 1980. Both plants have run well since initial start-up with only normal, expected problems. The turnkey contractor was General Electric. The U.S. consultant was Gilbert Associates, Inc. After 12 years of operation, the Talkha plant is in excellent condition with a good output record. Before conversion to a combined cycle plant, the yearly availability factor was over 90 percent.

Talkha Combined Cycle: The purpose of this project was to increase the efficiency of the existing gas turbine generating facilities by utilizing waste heat. The project consisted of upgrading the existing eight gas turbines by adding heat recovery steam generators and two steam turbine generators. A total of 110 megawatts of steam turbine generation capacity was added.

A.I.D. provided the total foreign exchange funding of \$65 million for the project. Gilbert Associates acted as the consultant. The design, supply, and installation of the equipment was provided by General Electric.

The project has produced additional energy without using additional fuel. The plant is operated as baseload capacity and had the highest efficiency of all thermal stations in 1990-1991.

Results: Each of the power plant projects added to the baseload generating capacity of the EEA. Generally, all covenants and conditions were satisfied *except for reform in energy pricing*. The Government of Egypt's failure to increase energy prices led to rapid growth in electrical consumption, along with inefficient energy uses. Cheap power encouraged wasteful practices and inefficient investments—including several large factories that would not be viable if energy were appropriately priced. Under pressure from A.I.D., the World Bank, and the International Monetary Fund, the Government of Egypt in 1989 agreed

to a pricing adjustment program that promises to bring energy prices to their "true economic value" by 1995.

The relationship of the three capital projects in the electrical power sector and the eight assessment issues is subsequently discussed. These results are based on interviews with relevant A.I.D. personnel, EEA management, technical assistance contractors, Egyptian businessmen, and Egyptian consultants and equipment suppliers.

Compatibility of Development and U.S. Trade Interests

The provision of electrical energy in Egypt was considered by A.I.D. and the Government of Egypt as a fundamental service infrastructure. None of the interviewees felt that the projects were primarily motivated by U.S. commercial interests. No evidence could be found that projects were designed or selected to assist a specific U.S. industry or company. On the other hand, there was also little question that without the A.I.D. projects, most U.S. companies would not have marketed their products or services in Egypt. The establishment by U.S. firms of offices in Egypt has not only provided for future Egyptian business opportunities, but also for Middle East sales. At least two U.S. companies stated that their Cairo offices have won other work in the Arab world, entailing U.S. management, hardware, and construction.

Respondents were in complete agreement that a reliable, efficient, and adequate supply of electrical energy was essential to Egypt's development.

Appropriateness of U.S. capital investment technology to Egypt's developmental needs. Power plant investment in Egypt has largely consisted of current off-the-shelf technology used throughout the world. Custom engineering and modifications are made to suit the site, the environment, and the fuel. Principal components are the boilers, turbines, generators, control systems, and spare parts. As there are no other electric utilities in Egypt, the market for these products is limited to the EEA. Some components, such as the turbines and computer-aided controls, can be considered state-of-the-art; however, to use older versions would mean sacrificing improvements to economic efficiency and reliability.

An exceptional example of high tech is the Talkha Combined Cycle plant. This facility is one of the more advanced designs in the world. There is no evidence that this plant is beyond the technical capabilities of EEA. The plant is located on a site where other generation technologies are in use and provides a dramatic and effective contrast between technologies. In the U.S. funded plant, all controls can be remotely controlled by computer. An automatic and continu-

ous record is made of facility and maintenance requirements, which are automatically noted. Engineering changes are also performed by computer, ensuring a uniform data base.

Fueled increasingly by natural gas, the power plants are relatively nonpolluting. Dual fuel capability (oil and natural gas) has given EEA flexibility, reduced environmental pollution, and lowered costs, while using an in-country supply of natural gas for which there is little export market.

None of the interviewees felt that the technology was inappropriate. However, many stressed the need for intensive and continuous training. The EEA and the distribution companies recognize the need for training and are vigorous in their insistence on it. An examination of the NECC, the Alexandria Distribution Company, and power plant operators all show the results of intensive ongoing training. Engineers at the NECC are capable of modifying existing hardware and software without U.S. assistance. The Alexandria Distribution Company is ahead of many U.S. utilities in the application of computer-assisted design. At Shoubrah and Talkha, preventative maintenance is the norm, resulting in significant reductions in unplanned outages, an indicator of the quality of training. Despite the institutional handicaps of low salaries, overstaffing, and loss of trained people to other Middle East countries, EEA has successfully met the challenge posed by operating and maintaining high technology equipment.

How have capital projects directly and indirectly supported U.S. exports of goods and services while supporting development? Without an adequate electricity supply, most sectors of the economy, particularly industry, commerce, agriculture, water supply, medical services, and tourism, would suffer. However, answers to the extent of indirect impact of capital projects were more varied. Some major equipment suppliers have, due to their initial introduction to Egypt on an A.I.D. project, initiated joint ventures. Egypt, through these joint ventures, now manufactures electrical distribution cable using some limited amounts of U.S. raw materials. There are also joint ventures in transformer repair and capacitor manufacturing. U.S. standards and specifications for electrical equipment have been adopted by the EEA and distribution companies, thereby assuring opportunities for U.S.-company bids for spare parts and new facilities. There was one interesting example of the EEA changing a European consultant's specifications to U.S. standards, thus allowing the U.S. company to successfully compete on a European-financed project.

Perhaps more importantly, U.S. management techniques have been adopted by Egyptian engineering and consulting firms. There is a small but growing Egyptian business base that prefers U.S. methods and equipment. If privatization of government-owned businesses proceeds, this edge should not only foster Egyptian enterprise, but also favor U.S. companies. However, the

interviewees also stated that there was a reluctance on the part of many U.S. companies to engage in the Egyptian market. Problems getting paid, a scarcity of foreign exchange, a relatively small market, and paperwork were all cited as reasons. In the electrical energy sector, a foundation has been provided for U.S. companies to compete. So far, little has developed. Whether the market develops will depend on EEA procurement practices, how rapidly the Egyptian private sector grows, and the aggressiveness of U.S. firms.

One example of a possible longer run developmental impact of U.S. capital projects is the current effort in Egypt to develop the complete capability to manufacture power plants, with the goal of exporting them in the future. The capability already exists to manufacture cable, capacitors, transformers, and many spare parts. Studies are underway to evaluate boiler production. As U.S. standards are commonly used, a market for U.S. instrumentation, components, software, and raw material could develop.

It is clear that the power plant projects have contributed to development. Providing the exposure to management techniques, engineering practices, and modern design has developed an Egyptian base of knowledge. So far, the development of a strong (non-A.I.D. funded) market in Egypt for U.S. electrical equipment has not taken place.

Policy Reform and Sector or Subsector Conditionality

All three power projects had conditions and covenants regarding

- Operations and maintenance
- Training
- Government of Egypt local currency funds
- Price reform

As noted, conditionality has been successful with one notable exception—price reform. Power projects have not been denied by A.I.D. rather, conditions have been relaxed based on promises from the EEA. The EEA states that it will cover all its expenses in 1993; however, this claim has often been made in the past. Current EEA management claims that the higher income-rate classes cover the cost of serving them. Many interviewees believed that without A.I.D. and World Bank pressure rates would not change. The following table illustrates the impact of pricing policy reform.

Table B-1. Development of Electricity Price by Sector
Percentage Increase

Year	Industry	Agric.	Comm'l	Residtl.	Total
1982-1983	9.0	3.9	5.0	5.1	10.7
1983-1984	27.1	16.8	15.5	4.7	16.9
1984-1985	25.9	8.8	0.0	0.0	16.6
1985-1986	40.4	39.7	48.4	28.2	33.7
1986-1987	13.1	18.4	26.6	0.3	8.8
1987-1988	29.6	22.2	32.0	5.9	26.4
1988-1989	11.1	6.5	25.7	3.7	8.4
1989-1990	35.7	57.0	-5.1	7.6	30.3
1990-1991	51.6	59.1	17.1	14.8	38.9
1991-1992	41.5	17.8	20.3	27.7	35.3
Avg./Yr.	27.8	23.7	17.6	9.4	21.1

Source: EEA, "Load and Energy Forecast," February 1992

These increases meant little previous to 1989, since inflation was running at a much greater pace. The increases in the last 3 years have been much more meaningful. Section 3 of the report and Appendix F provide more information on electricity price reforms.

Leveraging Other Donor and Private Sector Participation

U.S. involvement in the Shoubrah El Kheima thermal power plant helped bring in an additional \$500 million from other sources. The initial study for the El-Kureimat power plant was A.I.D.-financed and construction of the plant will cost about one billion dollars. The African Development Bank, the Islamic Bank, the Saudi Fund, and others are expected to finance the project. Planning is proceeding with A.I.D. providing about 20 percent of the total. By funding the El-Kureimat study, A.I.D. can claim credit for bringing in other donors to fund the project.

Westinghouse and Bechtel have formed joint ventures to continue to supply goods and services in Egypt.

Leveraging non-U.S. financial resources for U.S. procurement and generating follow-on U.S. sales after project completion? Power plant spare parts in most instances are U.S. supplied, as well as software to operate computer

systems. Most training and training manuals are in English and Arabic. U.S. specifications and standards are used, which should give U.S. firms an advantage. The previously cited example of EEA modifying European recommended specifications to U.S. standards is the most dramatic example of the effect of the use of U.S. standards. The EEA Chairman and NECC staff both stated their preference for U.S. products and software. U.S. specification will be used for future procurement, but other countries can manufacture to U.S. specs and it is not clear yet whether U.S. companies will be competitive.

A common impression of non-U.S. respondents was that although U.S. prices were high, product quality was good. However, many noted that U.S. firms were not aggressive in marketing. There were notable examples given of the lack of followup, especially in the sales of tools and small spare parts.

Support for Poverty Reduction and Meeting Basic Human Needs

It is hard to find specific examples of electricity directly meeting basic human needs. Indirectly, electricity supports basic human needs by pumping drinking water, lighting schools and health clinics, irrigating crops, and so forth.

Capital Project Benefits for the Private Sector

The Egyptian economy is still dominated by the public sector. The private sector is small and underdeveloped; however, private sector growth has been rapid and much of that growth has been made possible by an improved electrical system.

The most obvious and visible sector helped by the development of electrical capacity is tourism. Tourism has rapidly increased, becoming Egypt's number one foreign exchange earner. Remote tourist areas now have hotels and more modern facilities are being built in developed areas. Hurghada is an example of an area where hotels had electricity self-generation until the EEA connection. New hotels have been built in Alexandria and Cairo without backup generation facilities.

Other sectors have also benefited. Agricultural water pumping has become essential, especially since the installation of the high dam. A reliable electrical supply has contributed to the location of manufacturing and development of a Free Trade Zone in Alexandria. The rapid growth of industry would not have been possible without a dependable electricity supply.

Sustainability

Power plant projects are a clear illustration of the need for and value for training to create sustainable projects. In all three projects, training is an important component, with some training in the United States and some in Egypt. Shoubrah power station not only has large on-site training facilities, but also has an on-site control room facility. Classes are continuously provided at all levels and in all phases of plant operation. Results are obvious. Suppliers and technical assistance contractors remark on the quality of EEA operating engineers. Egyptian power plant operators are employed throughout the Middle East. Engineers have taken the initiative to develop testing facilities and software to increase the value and life of the equipment. Other parts of EEA are similarly motivated. EEA has fostered the maintenance and training ethic. More than likely when they retire, their replacements will have been brought up in an environment emphasizing training. Interviewees clearly responded that without this continuous training, the capital investment made by A.I.D. and others in the electrical sector would not be sustainable. The question arises, however, if EEA will have funds to continue the training. Adequate funding is dependent on cost recovery and better energy pricing, which have been very slow in developing.

One possible solution would be the privatization of EEA and the distribution companies. Despite the fact that the Government of Egypt has suggested it might privatize the electrical sector, few Egyptian felt it was realistic to expect rapid action. Private sector respondents were skeptical about the Government of Egypt's willingness to privatize and Government of Egypt respondents varied in their support for privatization.

APPENDIX C

FINDINGS FROM THE WATER AND WASTEWATER SECTOR

Introduction

The Government of Egypt lacked the resources needed to construct water and wastewater facility extensions and additional capacity to support a growing urban population. As a result, by the mid-1970s essential services originally designed for a much smaller population were severely overloaded. This situation was especially true in Cairo and Alexandria, Egypt's two largest cities; however, other major cities were experiencing similar utility overload problems.

For instance, by 1970 Cairo's sewerage system, designed to serve a population of 2 million, broke down under the pressure of a population approaching 6 million. The Alexandria system had been similarly neglected. As both systems were overloaded and in need of maintenance and rehabilitation, raw sewage often flooded streets in residential and commercial neighborhoods. Wastewater treatment plants were overloaded and in poor condition and some had ceased to function, with subsequent raw sewage passing directly to the Nile River, canals, and Mediterranean Sea.

Cairo's water supply system was also overloaded. Treatment facilities were producing finished water supplies that were 25 percent short of daily average demand. The treatment plant capacity needed to be expanded by 0.5 million cubic meters per day (cmd). The potable water transmission/distribution/storage system was also in major disrepair. Transmission mains were failing at normal maximum design pressures and system losses estimated at 27 percent.

The public utilities in Egypt's canal cities, Ismalia, Port Said, and Suez, were also experiencing similar overloads and service breakdowns due to system neglect compounded by damage sustained during the 1973 war.

A.I.D.'s Sector Strategy and Project Approach

A.I.D. program goals in the late 1970s focused on improving Egyptian health, productivity, and economic growth. This included an emphasis on providing adequate and reliable basic services to the urban areas of the country. The provision of these services were considered a prerequisite to Egypt's economic development.

In Cairo and Alexandria, the first three project interventions included:

- Cairo Water I
- Cairo Sewerage II
- Alexandria Sewerage I

These projects, along with other major projects funded by both by A.I.D. and other donors and begun simultaneously, were the beginning of a major rebuilding of essential urban public services.

Over the past 14 years, A.I.D. has invested approximately \$2 billion in water and sewage projects in eight Egyptian cities, with a combined 1980 population exceeding 17 million. In the past 10 years, A.I.D. has concentrated its projects in the urgently needed rehabilitation of existing facilities and the construction of new facilities designed to extend water and wastewater utilities to unserved areas of target cities.

In the mid-1980s, A.I.D.'s strategy began to shift from rehabilitation and construction to the equally important issue of sustainability, resulting in new strategy trends, including:

- Increased attention to wastewater
- Inclusion of wastewater treatment interventions
- Increased attention to secondary cities

Of the three trends, the shift in emphasis to sustainability gained the most attention, resulting in the following three activity focuses:

- *Facility Operations*: Starting in 1986, all major construction contracts included 2 to 3 years of operations and maintenance training and assistance by project-funded technical assistance teams.

- *Overall Institutional Development:* The Water/Wastewater Institutional Support Project, which was planned in the late 1980s, began in 1991. This project is designed to address and correct operations and maintenance weaknesses. There is still a need to improve the overall institutions to guarantee well-planned, budgeted, and managed operations and maintenance systems.
- *Policy Reform:* Although A.I.D. geared up project assistance to address the sustainability issue, it recognized that in order to improve the performance of government-controlled public utilities, policy reform is needed to make institutions more efficient and at the same time able to collect user revenues to support operations and maintenance costs.

All three activities support A.I.D.'s goal of increased access to efficient and reliable public utilities in urban areas as part of the overall urban development strategic objective. Interventions on all three levels were designed to eventually result in the establishment of efficient, autonomous, and effectively regulated private utilities.

Project Descriptions

Cairo Water I

This project consisted of the following three elements:

- Rehabilitation and expansion of the Rod El Farag Water Treatment Plant, to increase capacity of the facility from 200,000 cmd to 650,000 cmd
- Installation of six kilometers of new water transmission mains
- Installation of 40,000 house water connections

The project's main objective was to increase the quantity and quality of potable water for the central district of Cairo, benefiting approximately 600,000 people. The loan agreement was signed in September 1977 and the project ended in September 1989, after 12 years of implementation. The funding for the project included \$97.3 million from A.I.D. and an estimated \$48.5 million from the Government of Egypt, a total of \$145.8 million.

The treatment works included the raw water intake and pump station, new chemical feed and handling facilities, clarifiers, filtering units, filtered water pump stations, a backwater pump station or administration building, and 3.2 kilometer of 1,000 millimeter and 2.8 kilometer of 1,400 millimeter diameter ductile iron transmission mains with necessary appurtenances. In addition to the finished works, A.I.D. financed a major training program aimed at strengthening the administrative and management capabilities of the General Organization for Greater Cairo Water Supply (GOGCWS).

The Egyptian implementing agency was GOGCWS. American consulting engineers were used for technical assistance services to design, manage construction, and provide operations maintenance training, planning, and supervision. American construction companies in joint ventures with Egyptian firms carried out the construction of the facilities. Commodities procured under the project totaled \$4.53 million and \$1 million equivalent in local currency.

Cairo Sewerage II

This project was intended to improve, expand, and ensure proper management of the wastewater collection and treatment systems on the west bank of the Nile for the city of Cairo. This project is currently part of the Greater Cairo Wastewater Project that also includes funding from the UK Overseas Development Administration, Italy, the European Investment Bank, and others.

Cairo Sewerage II was designed to provide the core funding for the construction, design, construction management, system operations and maintenance, and management and training activities. The main elements of the project include

- Sewage collectors, culverts, and pump stations.
- Laterals and house connections (under a Fixed Amount Reimbursement program).
- Wastewater treatment plant rehabilitation and construction, including the rehabilitation of the Zenein secondary wastewater treatment plant with a capacity of 330,000 cmd and the new construction of the Abu Rawash primary wastewater treatment plant to provide an additional 440,000 cmd capacity on the west bank.

- Abu Rawash Emergency Drains Improvements (under a Fixed Amount Reimbursement program) to facilitate the effluent discharge from the plant.
- Sludge disposal facilities at the Abu Rawash Wastewater treatment plant for sludge produced at Zenein and Abu Rawash, including a major sludge pump station and remotely located sludge disposal facilities.

The project agreement was signed in August 1984 with completion planned for August 1994. To date, \$806 million has been authorized and \$669.3 million obligated by A.I.D. The Government of Egypt contribution has been estimated at L.E. 375.3 million.

Implementation by the Government of Egypt is presently through the Cairo Wastewater Organization with operations and maintenance to be undertaken by the General Organization for Sanitary Drainage (GOSD). The project also includes the funding of design and construction management services by (1) AMBRIC, an American, British, and Egyptian engineering firm consortium, and (2) Camp Dresser and McKee at the Abu Rawash wastewater treatment plant. American construction firms also carry out construction in joint ventures with Egyptian construction firms. Finally, the project includes an extensive 2-year, on-the-job training program implemented by technical assistance consultants for all completed facilities.

Alexandria Sewerage I

The Alexandria Wastewater System Expansion Project, which began in August 1979, was designed to support the improvement of health conditions in Alexandria by expanding and developing its wastewater collection, treatment, and disposal facilities. The project was based on Alexandria's master plan as part of the Alexandria Wastewater System Expansion Project. The Government of Egypt implementing institution for this project is currently the newly created Alexandria General Organization for Sanitary Drainage, which entered into a contract with the Wastewater Consultant Group (WWCG)—a consortium of two U.S. and two Egyptian firms—to provide the major design and construction supervision services on the project.

A Phased Implementation Plan was developed to address Alexandria's waste water needs. The Alexandria Wastewater System Expansion Project, the first phase of that plan, set out to

- Eliminate ponding and flooding of sewage in Alexandria by improving the sewage collection system.
- Upgrade two existing treatment plants to provide primary treatment capacity.
- Provide sludge facilities for the treatment plants.

Project Achievements

Cairo Water I

The Cairo Water I Project ended on September 30, 1989. The rehabilitation and expansion of the water treatment plant was completed in September 1986 and the capacity of the plant was increased from 200,000 to 650,000 cmd. Transmission mains were also installed. As a result, the quantity of potable water was increased and the quality of water improved for the central district of Cairo that includes much of Cairo's business, tourist, and industrial infrastructure.

The technical assistance contractor has carried out extensive training at the plant management and operational level, established and equipped an instrument calibration workshop, procured spare parts and tools for the water treatment plant, and produced several manuals and reports addressing operations and maintenance issues. Some of these reports include:

- *The Water Treatment Plant Operations and Maintenance Manual.* This is used to guide plant staff in the daily operation and maintenance of the water treatment plant.
- *Organization and Management Program.* The report sets out suggested organizational requirements to improve the GOGCWS, including staffing, training, and institutional improvements.
- *Water Waste Reduction Program.* This report attempted to quantify system losses and unaccounted-for water.
- *Inventory Control and Stores Plan.* This report was the basis for setting up a plant preventive maintenance program and spare parts inventory system.

Cairo Sewerage II

This project is still under construction; however, a recent project evaluation noted that progress and attainment of objectives is generally positive. Design and construction are of high quality, and while some delays in implementation have occurred, overall progress is very good. The evaluation noted that progress was impressive considering the magnitude of the project.

The new west bank conveyance system includes new collectors and pump stations. The Zenein wastewater treatment plant improvements were completed in early 1990 and are in operation. Operations and maintenance services are still being provided by the construction contractor. These include a training program for GOSD plant staff.

The Abu Rawash plant is nearing completion and will be ready to begin operations in November 1992. The plant will be operated by GOSD with assistance from the technical assistance contractor for a 2-year period with an option for a third year. The sludge handling facilities at Abu Rawash that will handle sludge for both wastewater treatment plants are still under construction, although sludge from Zenein is now thickened at Abu Rawash and dried on existing drying beds. A temporary sludge holding lagoon is also in use to handle Zenein sludge as the drying beds are too undersized to handle the entire volume. A new plan is under preparation that will include Abu Rawash and Zenein sludge pumping to a remote site for treatment and disposal.

Project implementation has resulted in an improved understanding of the operations and maintenance deficiencies of GOSD, including effective preventive maintenance at completed pump stations and the collection system as well as efficient operation and maintenance of the Zenein wastewater treatment plant. In response, the project has extended and intensified training programs.

Alexandria Sewerage I

The Alexandria Sewerage Expansion Project will be completed in 1994; its treatment plant is scheduled to go on-line in 1993. There were some construction delays during project implementation, but in general work has progressed satisfactorily. Delays were in part related to slow payments from the Government of Egypt to the project contractor; these problems were resolved and should not be a continuing difficulty. The lack of attention to training and operations and maintenance concerns were also addressed through a 1990 addition to the project's original scope of work to include a comprehensive operations and maintenance program.

Currently outstanding problems regarding the project center around sustainability concerns autonomy for the sanitation authority and self-sufficiency in operations and maintenance cost recovery. Currently, the sanitation authority does not collect charges sufficient to cover the operations and maintenance costs, partly due to its inability to raise user fees and other bureaucratic problems. The Cairo Mission is working to overcome these issues before funding any future sanitation projects in Alexandria.

The project, once completed, will have significant developmental impact—targeting 70 percent of the population in the project areas. Benefits to the industrial development of the city can be found in terms of the project's contribution to (1) a cleaner and safer commercial environment, (2) the exchange of new technologies and techniques to the local private sector, (3) improved professionalism in engineering design and operations, and (4) spin-off effects from trained staff moving to the private sector.

Future issues in need of attention in Alexandria will encompass areas not targeted under the Alexandria Sewerage Expansion Project. These include the Central Zone, which is the main commercial district for the city, and the Outer West Zone, which is growing rapidly but has no sewers.

Findings

Compatibility of Development and U.S. Trade Interests

Virtually all respondents agreed that the three projects in this sector were selected and designed by A.I.D. based on their importance to development in Egypt. The obvious need for the projects, in terms of health and environmental benefits was restated several times, especially for the sewerage projects.

Each of these projects did include the funding of U.S. technical assistance in design, construction management, and construction, and also procurement of U.S. equipment and materials. Several respondents reported that the U.S. technical assistance was necessary for the following:

- *Design and construction management.* Although Egyptian engineering firms are familiar with public health engineering, they lack the experience in the planning, design, and cost estimating of large facilities.
- *Construction.* The transmission (water) and collection (wastewater) pipelines involved the installation of large diameter pipes in difficult settings. Egyptian construction companies lack experience in such

large and complex jobs. Treatment plant construction also required skills in facility construction beyond those available with Egyptian contractors.

While Egyptian development was considered the goal of the three projects, respondents pointed out several examples of other secondary benefits in the following three major categories:

- Promotion of U.S. equipment/commodities and engineering, construction management and implementation services
- Significant levels of short-term employment opportunities in the construction sector
- The upgrading of a considerable portion of the Egyptian engineering and construction sector firms and personnel exposed to American organization and commitment to quality work

Appropriateness of U.S. Technology to the Needs of Egypt

The A.I.D. projects used treatment processes virtually identical to those constructed in Cairo between 1910 and 1920. With that fact in mind, it was not surprising that all respondents reported that the technology used in these projects was certainly appropriate and well understood by the Egyptian engineers and technicians now responsible for their operation and maintenance.

U.S. technical assistance contractors reported that appropriate technology (lower-tech) solutions were incorporated into all facility plans for each of the three projects under study. For example, the Abu Rawash treatment plant under the Cairo Sewerage II project was designed to provide primary treatment only, to allow for simplified process control and to minimize costs. The plant is designed to be expanded to a secondary treatment facility when that level of treatment is deemed necessary.

Under Cairo Sewerage II, major pump stations were all configured with low-lift screw pumps, another appropriate technology solution, allowing a main interceptor system that is entirely based on gravity to flow instead of a more complicated system of pressure force mains.

Technical assistance contractors reported that, in fact, Egyptian officials desired more high-tech equipment and processes in the projects. They said that both they and A.I.D. constantly reviewed designs to ensure that appropriate

technology approaches using easy-to-operate-and-maintain equipment/materials were always used on the projects.

How did capital projects that concentrated on areas where the U.S. has a technological edge (developing a future U.S. export market) effectively contribute to development? For the three projects studied, no respondent reported a case in which the United States possessed a technological edge in terms of equipment or expertise. However, all Egyptian implementing and operations and maintenance agency officials did report that U.S. equipment and materials were either equal to or better than that provided by European or Asian countries. One respondent who has worked in Egypt for several years for a major U.S. technical assistance contractor stated that although the U.S. did not possess a technological edge, it certainly had a "leading edge," defined in terms of U.S. equipment as being:

- Efficient
- Easiest to operate and maintain
- Of the highest quality

In discussing this recognition of high-quality products and services, Government of Egypt officials compared U.S. equipment to German, English, French, Italian, and Japanese equipment, which include pumps, both screw, centrifugal, and reciprocating (chemical feed), stand-by generator sets, process equipment at treatment plants, process and electric controls, process control instrumentation, and construction equipment and materials, such as ductile iron water pipe. In every case, officials said that they thought U.S. products were of the highest quality and the most reliable.

In terms of technical assistance under all three projects, Government of Egypt officials gave high marks to U.S. engineering design and construction management firms for their organizational and technical skills as well as their work ethic. They also reported that U.S. construction companies were admired for the quality and organization of their work. They felt that this admiration was already being emulated by many Egyptian engineering and construction firms that have worked on the three projects studied. This was particularly highlighted for Cairo Sewerage II, on which work is still ongoing. The installation of major collectors (up to 2,750 mm diameter) in densely crowded city streets, where other utility locations are for the most part unknown and where operational space is at a minimum, impressed counterparts and Egyptian joint venture contractors.

According to implementing agency officials, in terms of quality, organization, and reliability, they would gladly use U.S. equipment and technical assistance services in the future. In terms of cost, however, U.S. equipment and services were reported to be more expensive than competitor country equipment and services. This fact led to questions about their competitiveness in non-A.I.D.-funded projects.

All three project sites exhibited high-quality finished work and facilities that were operating as designed. According to implementing and operations and maintenance agency staff, Egyptian joint venture engineering and construction firms have gained considerable knowledge in construction planning, design, management, and quality control. Although this is a secondary or fall-out benefit from the projects, this transfer of knowledge during the past 14 years has resulted in better engineering firms and contractors, and thus in better designed and constructed work in Egypt.

Benefits to Egypt's Private Sector

In terms of overcoming bottlenecks, respondents reported that water and sewerage projects were instrumental in providing essential services to the commercial sector in both Cairo and Alexandria. Provision of these services has resulted in a more efficient commercial sector. Specific examples of this were not forthcoming; however, all respondents reported that these services were a sine qua non to commercial development in the target cities.

Additionally, in Alexandria, the new treatment facilities will help reduce water pollution on Mediterranean beaches. A respondent noted that the difference in Cairo from 10 years before was astounding and that because of the reliability of services, foreign businesses looking to establish regional headquarters in the Middle East were now considering, and in some cases choosing, Cairo rather than more traditional sites such as Turkey or the Gulf states, depending on their target markets.

Policy reform and sector or subsector conditionality. All three projects had CPs and/or covenants related to sustainability:

- The Government of Egypt was to ensure that user charges or tariffs were collected from service subscribers so as to ensure that operation and maintenance expenditures were covered by revenues
- The Government of Egypt was to ensure that adequate operations and maintenance was provided at project completion.

Progress under these CPs was mixed. In 1984, all CPs and covenants were removed from the three projects and made part of a memorandum formed of understanding between the Government of Egypt and A.I.D. This memorandum formed the basis of a policy reform dialogue between the Government of Egypt and A.I.D. The purpose of this was to carry the dialogue to a higher appropriate level in the Government of Egypt.

Whereas strict review of the Government of Egypt response to the project's CPs and covenants showed disappointing progress in terms of tariff increases, water and sewerage charges were raised in both Cairo and Alexandria. Do the tariffs pay for utility operations and maintenance costs? Not yet, although the Government of Egypt is committed to this precept and operations and maintenance agency respondents all unequivocally recognize its need. Will tariffs be raised to cover these expenses in the agreed upon time? According to respondents, it will occur but probably not on schedule.

Presently, the mission is also addressing operations and maintenance institutional autonomy with the Government of Egypt as well. This dialogue is well advanced and the Government of Egypt recognizes the need for the privatization of these utilities so as to improve their performance. Respondents reported that the Government of Egypt would privatize these institutions in the future, but that this was not imminent.

Leveraging other donor and private sector participation. No examples of A.I.D. directly leveraging other donors to participate in the water or wastewater sector in Cairo or Alexandria were found. Respondents did, however, report that A.I.D.'s involvement did somewhat influence other donor's decisions to consider funding similar projects. For instance, A.I.D. funded the Cairo city master plan for the water supply system and had it revised later with both major studies being carried out by American engineering firms. This master plan was used by other donors as a basis to fund other projects.

Another example of an A.I.D. project presence influencing a donor was the Japanese funding of the construction of a major sewer collector, associated house connections, and a major pump station in the Giza area of Cairo, alongside and tying into the facilities being constructed under the A.I.D. Cairo Sewerage II project.

Leveraging non-U.S. financial resources and generating follow-on U.S. sales after project completion. No instances of the procurement of U.S. equipment or materials by non-A.I.D. sources were reported. In terms of follow-on sales, Egyptian Government respondents said they would procure spares from the

United States for the equipment supplied under the project. To date, with some minor exceptions, this has rarely taken place.

- Each of the A.I.D. projects funded a projected 5 years of spares.
- When additional parts were needed they were either provided under a follow-on A.I.D. project or through the CIP program.

The Chairman of GOGCWS reported that American AWWA specifications were now being used by his organization to specify some equipment and materials purchased by GOGCWS without A.I.D. funding. Other respondents also pointed out that the use of U.S. specifications for equipment/commodities helps to promote U.S. sales. They said that ASTM and ANSI specifications are also now being used in Egypt and credited the A.I.D. projects for their adoption.

Two implementing-agency respondents reported that American suppliers did not aggressively market their products in Egypt, even after they were successfully introduced to Egypt through the A.I.D. projects. They said that European and Asian firms seemed more interested in their business. In one case, an Egyptian respondent responsible for agency procurement noted that some American firms contacted about the supply of spares never responded even though the tender was for the supply of spares necessary for American equipment!

In terms of U.S. technical assistance providers, some U.S. engineering firms have received non-A.I.D.-funded contracts to design or manage construction on other projects. Two firms have set up independent joint venture firms with established Egyptian consultants. These joint ventures are marketing their services for non-A.I.D. funded work in Egypt.

The ability or motivation to market services for non-A.I.D. work seems to depend on the firm. Firms that pursue non-A.I.D. funded work have a history of doing so in other countries. These firms strongly agreed that carrying out A.I.D. funded work under the three projects helped them establish themselves, leading to their success in carrying out follow-on work.

Some American construction contractors agreed that carrying out A.I.D. work under Cairo Sewerage II will help to establish them, but, with two exceptions, none are actively seeking other work. One firm has a Government of Egypt funded construction contract with the Suez Canal Organization and the other is bidding on a non-A.I.D.-funded sewerage contract on the east bank in Cairo. Again, the exception is a firm that has a history of successfully competing outside the U.S. project-funded venue.

Having pointed out that non-A.I.D.-funded work was undertaken by these U.S. engineering firms and contractors and that their A.I.D. contracts are what led them to Egypt thereby assisting them to get the follow-on work, the following two qualifiers need to be stated:

- Without exception, U.S. firms still rely on A.I.D. as their primary source of work. Most firms will not pursue non-A.I.D.-funded work because they do not see the non-A.I.D. market as lucrative or safe. Most firms felt that they would not be in Egypt without A.I.D. and that they will pull out at the completion of their A.I.D.-funded work.
- The value of the non-A.I.D.-funded, follow-on work is not equal in magnitude to their A.I.D. work.

In both the cases of U.S. equipment and technical assistance providers (design, construction management, and construction), cost was a major issue in follow-on sales or service contracts. Both Egyptian implementing officials and U.S. technical assistance providers who responded admitted that the cost of American products and services is higher than their competitors from European and Asian countries. It was generally felt that this will influence their ability to generate follow-on sales of equipment or services.

Egyptian Government respondents recognized that cost was related to superior products and services but that, in open tenders, cost would be the major deciding factor. Some officials postulated that costs on A.I.D. work was artificially higher than on non-A.I.D. work due to competition being restricted to U.S. firms. U.S. engineering and construction firm respondents confirmed this.

In summary, all respondents said that participation in these projects would lead to follow-on sales of U.S. equipment in both the private and public sectors. U.S. service providers also claimed that their participation would lead to other work. However, few instances of this follow-on effect were found. Perhaps it is still too early to accurately see this effect.

Support for poverty reduction and meeting basic human needs. For all three projects, the important health benefits from improved water and wastewater services to the residents of Cairo and Alexandria remain unquantifiable. Under Cairo Water I, the provision of the enlarged Rod El Farag water treatment plant allows much greater coverage of the city with safe potable water, providing an increased supply to all customers. Access to increased amounts of potable water prevents both water-borne and water-washed diseases.

It is also expected that both wastewater projects will markedly contribute to the health of residents in Cairo and Alexandria by eliminating raw sewage street flooding that is common in several parts of both cities. As more of the project facilities are completed, flooding will continue to decrease. The effects of that flooding in crowded urban areas can only be guessed at in terms of their disease spreading potential and their secondary deleterious effects such as breeding grounds for mosquitoes and other disease spreading vectors. In Alexandria typhoid, paratyphoid, and hepatitis have been especially prevalent and their incidence blamed on poor sanitary conditions (street flooding) in the residential areas of the city.

Private Sector Benefits

All respondents felt that the improved services provided under the projects would assist the development and operation of the commercial sector in Cairo and Alexandria, yet no specific examples were reported. Also, several small industries that needed adequate water and wastewater services are now growing and/or being established in the cities.

The private engineering and construction sector definitely benefited from working alongside American consultant engineering and construction firms. This secondary project benefit will help Egyptian development for follow-on, non-A.I.D. funded work through increased know-how and devotion to quality control.

Sustainability

Sustainability of the A.I.D.-funded project interventions is the key issue of the day for mission staff, technical assistance contractors, and Government of Egypt implementing agency officials. While the technology used in the projects is thought to be appropriate in terms of the Egyptian implementing agency capability to understand, operate, and maintain the facilities, no respondent felt that the institutions responsible for operations and maintenance were yet in a position to ensure that the facilities would function adequately over their design service lives.

Respondents reported that A.I.D. project operations and maintenance improvement interventions were appropriate and if successful would go a long way in helping to address the issue of facility sustainability. They all agreed, however, that project training interventions would not be enough. Considering the size of the facilities funded under the three projects, basic changes in institutional formation, authorities, and responsibilities would be needed.

A.I.D.'s success in the policy reform arena will be a major determinant in the ability of these agencies to successfully operate and maintain these facilities in the future. All three agencies need some basic restructuring in terms of management, budgeting/accounting, cost recovery capability, operational procedures, and staffing policies. In summary, all three need to be modified ultimately to resemble autonomous publicly regulated, private utilities.

The three agencies responsible for facility operations and maintenance are GOSD, the Alexandria Organization for Sanitary Drainage, and GOGCWS. All three have similar institutional constraints. Respondents reported that the following four major problems need to be addressed:

- *Staffing.* All three agencies are heavily overstaffed due to existing Government of Egypt employment policy. Also, salaries for engineers and technicians are low, leading to the most capable staff going to the private sector or to other positions overseas, mainly to the Gulf countries. This problem is actually made worse by the training given under the three A.I.D. projects. After training, staff are more attractive to the private sector and to overseas countries. They are more effectively able to market themselves and leave the low-paying government service for more lucrative salaries.

The problem of low salaries also affects the motivation of operations and maintenance staff to carry out their duties effectively. The Government of Egypt employment regulations also do not allow employers, in these cases government entities, to release staff who do not perform, under any but the most compelling conditions.

To solve these problems, more attractive salary and benefit packages are needed. Staffing levels need to be reduced and staff need to be motivated to do their jobs professionally.

- *Organization.* Procedures used to guide operations and maintenance are slow and cumbersome as they must comply with Government of Egypt regulations and restrictions. Procedures need to be changed so that planning and budgeting are based on actual historical facility performance and needs. Planning must be done using proven preventive maintenance techniques not now incorporated in the activities of the three agencies. Without these changes, equipment failures will occur that can result in significant downtime. As the completed works age, service disruptions will increase in frequency, downtime duration will grow, and the cost to rectify problems will increase.

A preventive maintenance system is predicated on good record keeping. For these agencies with their extensive equipment inventories spread over large areas, only computerized systems that are well maintained can do the job.

- *Cost Recovery.* The ability of these agencies to pay for their required operation and maintenance costs depends on their ability to collect adequate user charges. At this time, user charges are collected but do not meet these costs. Government of Egypt subsidies are needed to supplement the cost of providing these services. Until sufficient fees are charged and collected from users, *based on the real cost to perform adequate operations and maintenance*, these agencies will continue only those operations deemed essential, resulting in curative rather than preventive maintenance.
- *Technical Capability.* Even though operations and maintenance agency staff can operate and maintain the electromechanical equipment provided under the projects, an understanding of preventive maintenance needs to be taught. Large generators, pumps, and other equipment that are over 50-years old and still in operation testify to technical capabilities. However respondents report that in many cases, until equipment breaks down, it is not noticed. Better process control of treatment units in plants is also required.

At the Rod El Farag water treatment plant, control room process instrumentation is nonoperational and the process laboratory, although in good condition, is not used. Instead, the plant is for the most part run by feel, or familiarity with the raw water source and needed operations. GOGCWS staff report that tests are done daily to administer flocculent and disinfection chemical dosages; however, this appeared not to be the case at all. Evidence of this can be seen in the clarifiers where considerable particulate matter is observed moving over the weirs.

At the Zenein wastewater treatment plant, employing secondary treatment¹, American contractors are continuing the management of plant operations and maintenance training for another year as it is felt that GOSD forces are not yet ready to undertake the plant operations

¹This existing plant was rehabilitated under Cairo Sewerage II. It was originally constructed as a secondary treatment plant as opposed to the new Abu Rawash plant which is now under construction.

and maintenance independently. Generally speaking, process control in wastewater treatment plants, especially those employing secondary treatment, is more complex than at water treatment plants. The use of the laboratory to guide plant operations at Abu Rawash and at Zenein will be critical in the future.

- Both the Cairo Sewerage II and the Alexandria Sewerage I projects include a 2-year, on-the-job training component for engineers and technicians provided by technical assistance contractors.
- A.I.D. plans a separate project, the Institutional Strengthening Project, to assist GOSD through 15 separate activities, targeting management, budget, and procedure issues.

APPENDIX D

FINDINGS CONCERNING U.S. EQUIPMENT AND SERVICES EXPORTERS

Although this evaluation focuses on specific sectors and projects, the team also interviewed a representative cross-section of Egyptian representatives of U.S. manufactured equipment. Respondents included representatives of U.S. manufactures who provide construction materials such as ductile-iron pipe; equipment such as welding sets, control instrumentation, electrical controls; heavy construction equipment; and large power generating equipment.

Although the respondents were aware of the developmental benefits of capital projects, the results of the interviews are shown below only for issues and questions relating to the commercial impacts of A.I.D. capital projects

Respondents echoed the responses given in the project interviews, which appear in Appendixes A, B, and C of this evaluation. The technology level of U.S. supplied products on A.I.D.-funded capital projects was judged appropriate to the operations and maintenance abilities of the Egyptian engineers and technicians who were responsible for operation and maintenance. They all gave examples of similar equipment already being successfully used in both public and private projects.

U.S. manufactured goods were not considered as more advanced technically than similar products available from Europe and Japan. Respondents said that U.S. manufactured goods were considered by Egyptians in both the public and private sector to be of the best quality. They also said that German, British, and Japanese equipment and materials were usually in the same class, however sometimes not as good.

Respondents said that the use of so much American equipment and materials on the A.I.D.-funded work in Cairo and Alexandria was good for Egypt since these products last longer and provide service more reliably than products from other countries.

None of the respondents gave examples of other donors purchasing U.S. equipment or materials for use on non-A.I.D.-funded projects.

Several respondents reported that U.S. manufactured products were regularly sold in Egypt prior to the advent of A.I.D.-funded capital projects. An equal number reported that the first sales of their products occurred on A.I.D.-funded capital projects. Many felt strongly that the A.I.D. projects were positively affecting non-A.I.D.-funded sales in both the public and private sectors because of increased exposure. Most, however, said that the biggest share of their business depended on the A.I.D. program. A quarter of the respondents said that their only business was A.I.D.-funded. Even these, however, reported that non-A.I.D.-funded sales were possible.

Several companies were selling spare parts for equipment procured under earlier A.I.D. projects. Two respondents said that these spares were procured under the A.I.D. CIP program. One respondent said that this was not as attractive an option as it was now that the Egyptian pound is not overvalued. The respondent went on to say, however, that with the dollar recently declining relative to other currencies, U.S. equipment was currently more attractive. Other suppliers were selling U.S. made spares and supplies to U.S. contractors in-country and were also performing under maintenance contracts for the U.S. contractors as well.

Several respondents pointed out that although U.S. equipment was perceived superior in quality by the public and private sector, it was also more expensive, especially when compared to French or Italian products. This fact affected sales of U.S. equipment, especially in the public sector. Respondents also said that some private sector concerns purchase U.S. equipment even when it is more expensive as they understand the quality issue better and do not have to follow government rules concerning strict acceptance of low bids.

Most respondents said that the A.I.D. program offered them an excellent opportunity to open the door for U.S. made goods in Egypt. These same respondents also were handling products made in European countries or Japan. They said that many U.S. firms did not seem interested or as aggressive about entering Egypt as did the European and Japanese firms. They pointed to several specific examples of U.S. firms either not following up on leads, not submitting proper paperwork, and in the worst case, not responding to an invitation to bid on a spare parts contract. They further gave examples of how European and Japanese firms were much more prompt in replying to inquiries, gave more complete information, and generally were more attentive to the Egyptian market.

This must be contrasted with other U.S. firms that were reported to behave similarly to their European and Japanese competitors, which included construction equipment manufacturers and a few others who are well established in several other countries around the world. This difference in marketing philosophy has several explanations, chiefly that U.S. firms have a large market in the U.S., while European and Japanese companies depend more heavily on their overseas sales. Also, Europe is much closer to Egypt, which reduces shipping time and costs. Nevertheless, respondents who represented the less aggressive U.S. companies virtually all said that the U.S. firms they represented could do more business in Egypt if they were more interested and aggressive.

One representative of large power generating equipment said that concessional funding assistance to competitors from European countries negatively affected their business. He said that U.S. Export-Import Bank credits, as well as other concessions, needed to be on par with those provided to their competitors. None of the suppliers of the relatively smaller products reported concessional assistance as a problem.

The respondents reported that Egyptian public sector agencies now responsible for the operations and maintenance of U.S. products supplied under the A.I.D. projects were experiencing difficulties due to organizational constraints that reduced their operational effectiveness. Cited as examples were the following:

- Agencies were overstaffed and staff underpaid, with the best staff either moving to the private sector or abroad when they had the chance.
- Government bureaucratic rules regarding procurement hampered the timely purchase of needed parts, extending equipment downtime. Several examples of this were given. Tenders for new equipment and spares were conducted using cumbersome processes and in some cases contracts were awarded for products that did not meet specifications because of strict adherence to the requirement of accepting low-cost bids without regard to quality or standardization.
- Agency staff, although technically competent, needed to move to preventive maintenance programs instead of curative maintenance. Respondents said that preventive programs are wrongly thought of as more expensive and that government policy puts a premium on low-cost maintenance, which discourages preventive maintenance.

All the suppliers reported that the A.I.D.-funded training given to agency engineers and technicians was adequate and that Egyptian engineers and technicians were able to properly operate and maintain equipment if they could be motivated to do so.

Virtually all respondents agreed that some agencies were better than others in terms of efficiency. The following is a ranking of agencies (from best to worst) in terms of their efficiency:

- Egypt Petroleum Organization
- Egyptian Army and Navy
- EEA
- Suez Canal Organization
- ARENTO (Telephone company)
- GOGCWS
- GOSD

Two respondents noted that EEA officials had approached them about beginning a preventive maintenance program for their equipment. Another noted that the telephone company also is comparatively good in terms of equipment maintenance.

In summary, the results of these interviews indicate that significant institutional problems still exist in the agencies responsible for operating and maintaining U.S. equipment on A.I.D.-funded projects.

APPENDIX E

AID, TRADE, AND CAPITAL PROJECTS

A CDIE Technical Report, *U.S. Aid and Trade in Egypt* (Fox 1994), examines the relationship of aid and trade over the last 15 years. It analyzes the overall levels of U.S. exports to Egypt, total U.S. aid to Egypt (both economic and military aid), and various categories of U.S. capital goods exports. That analysis differs from the more micro approach of this study, which analyzes the experiences of individual firms and the impact of individual A.I.D.-funded projects.

Before analyzing the factors influencing U.S. export performance in Egypt, it is useful to see how successful the United States has been in exporting to the world's developing country markets and how U.S. performance compares to that of other developed countries. While there have been year-to-year swings and shifts, during the last 20 years exports from developed countries (the OECD nations) to developing countries increased by three and a half times. That increase is in real terms (excluding inflation). The U.S. share of exports was influenced by trends in U.S. competitiveness in different industries, by changes in the U.S. exchange rate, and by changes in demand in different less-developed countries markets. During the last 20 years, the U.S. share of OECD exports to developing countries averaged 23 to 24 percent a year, with a slight upward trend during the period. In exports to the less-developed country markets, the United States has remained competitive with other developed countries.

Beginning with the improvement in political relations and the resumption of U.S. assistance in the mid-1970s, U.S. exports to Egypt (in real, inflation-adjusted terms) rose during the last half of the 1970s, peaking in 1982. U.S. exports declined steadily through 1987, and then recovered somewhat. By 1991, U.S. exports were still about 7 percent lower the 1982 level. This contrasts with U.S. exports to the less-developed countries world as a whole, which rose by 42 percent over the 1982-91 period (again in inflation adjusted dollars). U.S. assistance to Egypt (economic, PL-480, and military) remained about stable in nominal terms during the period, with a slow decline in real value in the late 1980s as inflation eroded the real value of constant nominal levels.

With the initiation of a large U.S. economic and military aid program in the mid-1970s, one would expect to see an impact on the trade side (since procurement of almost all U.S. assistance is tied to the United States). However, when the aid was provided, it appeared as Egyptian imports from the United States—the United States provides assistance funds used by Egypt to buy U.S. goods and services. As aid projects aged, they required spares and replacements, which most likely were imported from the United States. There might also be follow-on projects that require U.S. imports and follow-on use of U.S. engineering firms. During several years, such "additional imports" could be quite large. However, the trade data do not show the effect of any additional U.S. exports.

During the last 15 years, U.S. assistance (economic and military) has continued about equal to total U.S. exports. In half of the years, aid exceeded exports; in the other half, exports exceeded aid. Overall, cumulative U.S. exports (in constant 1982 dollars) totaled \$28 billion, whereas U.S. assistance exceeded \$30 billion (again in constant dollars). This represents 92 cents in U.S. exports for each dollar that the United States provided to Egypt over the period, suggesting that U.S. assistance has not had a catalytic effect on total U.S. exports—additional exports were not generated.

Since most of the U.S. economic assistance focused on capital goods and equipment, and military assistance also included much hardware, one might expect to see an impact on U.S. manufactured-goods exports. The U.S. share of OECD manufactured-goods exports to Egypt was 25 percent in 1973 and 1974 (this was before the resumption of the U.S. assistance program). The resumption of large-scale aid in 1976 appears to have had no effect on the U.S. share of the OECD total; the U.S. share declined moderately through the 1975 to 1987 period. The U.S. share again rose in 1988 to 1990 to 28 percent. For the 1975-1990 period, the U.S. share remained relatively stable and the U.S. has maintained, but not significantly increased, its market share in Egypt vis-a-vis the other industrialized countries. It is also useful to put this in perspective with U.S. manufactured goods exports to developing countries in general.

The United States provided an average of 21 percent of Egypt's capital-goods imports from developed countries during 1978-1990, compared to a 23 percent U.S. share for all developing countries. The U.S. market share increased in both markets. During the 1978-1990 period, the growth in the U.S. share was faster in Egypt than for all developing countries. By 1990, the U.S. share to Egypt had reached the less-developed countries' average of 23 percent.

It is also interesting to examine the nine categories of capital-goods exports. The U.S. market share in Egypt during 1978-1990 was higher on average than in all less-developed countries in only 2 of the 9 categories—power

generation equipment and other transport equipment. In the cases of *motor vehicles* and *computers*, the U.S. share in Egypt was dramatically lower than in the rest of the developing world. A.I.D. funded a number of power projects, which explains the strong U.S. showing in the category of *power generating equipment*. For *other transport equipment* the rise in the U.S. share in Egypt was dramatic, attributable to large Egyptian purchases of aircraft over the last several years, both for military and civilian purposes. Aircraft have been the single largest U.S. capital-goods export to Egypt in recent years, usually accounting for one-fourth to one-third of the total. *Excluding aircraft, the U.S. share of the Egyptian market for capital goods shows a decline during the last 12 years.*

A final issue has to do with the way A.I.D. conducts its business. Financing of capital projects is episodic. The project sales are large but there is limited continuity in the types of products from year to year. In many respects, the same is true for commodity import programs. While competitive bidding ensures that the lowest price is obtained, it may limit the potential for developing ongoing relationships that make possible a steady stream of U.S. exports. In addition, much of the U.S. assistance was provided to the Egyptian Government (the Ministry of Defense for military assistance and a number of government ministries and parastatals for A.I.D. assistance).

In the non-A.I.D. world, businesses and many government agencies often do not use competitive bidding. One-shot deals are not in the interest of either the buyer or the seller. Buyers and sellers need to develop the trust and sense of shared benefits that minimize costs over the longer term. By interposing between the buyer and seller of U.S. products, A.I.D.'s competitive bidding processes may prevent the development of such relationships. It may make U.S. firms less willing to make commitments of resources to cultivating potential buyers in Egypt.



APPENDIX F

CAPITAL PROJECTS AND POLICY REFORM

Electric Power Sector Policy Reforms

The overall effectiveness of power projects in promoting sector policy reforms has been very limited. The three power projects reviewed in this evaluation (Helwan and Talkha Gas Turbine Plants, 1976-1980; Shoubrah El Kheima Thermal Power Plant, 1979-1991; and Talkha Combined Cycle Addition, 1986-90) were relatively unsuccessful in achieving sector policy reform being implemented.

The A.I.D. projects beginning in 1976 attempted to improve the financial and economic soundness of the EEA. Project policy conditionality focused on (1) reducing EEA's debt-to-equity ratio, (2) improving the rate of return on EEA's fixed assets, and (3) increasing electric power tariffs to cover all generation and distribution costs.

1. *Debt-to-Equity Ratio.* The 1976 Helwan and Talkha project included a covenant requiring EEA's debt-to-equity ratio to be no greater than 1.5:1 within 3 years. The 1979 Shoubrah Power Plant contained a similar covenant.

2. *Rate of Return on Fixed Assets.* The 1976 Helwan and Talkha project included a requirement that the rate of return on EEA fixed assets increase to 9 percent within 3 years. The 1979 Shoubrah project initially strengthened this conditionality, making it a condition precedent to disbursement. However, disagreement over the methodology for reevaluating assets made compliance with this condition problematic. It was deleted in the 1981 Shoubrah Power Plant Amendment.

3. *Power Tariffs.* The 1976 Helwan and Talkha project had a covenant requiring that tariffs be increased to achieve the proposed 9 percent rate of return on assets. The 1979 Shoubrah Power Plant included this as both a conditional precedent and covenant. The First Amendment to the Power Plant in 1981 deleted this conditionality and replaced it with covenants requiring EEA to use ongoing tariff studies as the basis for tariff reform. Subsequent Power Plant Amendments (1984 and 1985) and the 1986 Talkha Combined Cycle Power Plant

shifted to covenants requiring EEA to periodically consult with A.I.D. on power tariffs and their impact on financial viability.

Performance to date indicates that the debt-to-equity ratio target has not been achieved. A debt-to-equity ratio of 1.5:1 or less is the equivalent to debt/(debt+equity) being 60 percent or less. EEA's debt/(debt+equity) initially improved, from 74 percent in 1976, 68 percent in 1978, and 65 percent in 1985. However, it increased to 84 percent in 1989, before declining to 67.7 percent in 1992. The World Bank projects this ratio to remain in this range through 1999. Compliance with this indicator was complicated by the need to periodically reevaluate assets and disagreement among Government of Egypt, World Bank, and A.I.D. staff over the correct methodology.

The rate of return on EEA fixed assets remained well below the 9 percent target until 1992. The World Bank estimates that the rate of return on properly reevaluated assets remained in the 2 percent to 3 percent range through 1990, increased to 8.5 percent in 1992, and is projected to increase to 9.3 percent in 1993 as a result tariff increases.

Tariffs increased year-by-year between 1977 and 1992 in nominal terms, from .8 piasters/kilowatt hour (KWH) (\$.012) in 1977 to 8.7 piasters/KWH (\$.026) in 1992. However, inflation was greater than the tariff increases up through 1989, resulting in declining real tariffs (in 1991 dollars), from \$.0231/KWH in 1977 to \$.0141/KWH in 1989. Since 1989, real tariffs increased to an estimated \$.0193/KWH in 1991 and \$.0251/KWH in 1992. Compared to the World Bank estimate of long-run marginal cost of power generation and distribution in Egypt, this represents 44.8 percent of long-run marginal cost in 1991 (\$.0431/KWH) and 59.7 of long-run marginal cost in 1992. These recent price increases were the result of A.I.D./World Bank/International Monetary Fund nonproject policy reforms. Overall, however, during the period when the three A.I.D. electrical generation projects were provided, project-based policy reform was not successful.

The A.I.D./Egypt FY 1990 Action Plan (March 1989) review of electric pricing policy reform pointed to limited success with project supported sector policy reform. Egyptian electricity prices represents less than one-fourth of real economic costs. These subsidized prices have resulted in excessive consumption. A.I.D. and other donors, including the World Bank, have consistently urged the Government of Egypt to substantially increase energy prices. Both A.I.D. and the World Bank had followed the policy of relating funding levels for electricity generation projects to progress on adjustment of electricity rates towards more realistic levels. These efforts met with limited success. Over the 10 years

before 1989, energy rates did not keep up with inflation, signifying that real energy prices were declining.

By 1987, both A.I.D. and the World Bank terminated assistance to the electrical generation sector. It was not until the Government of Egypt, facing a deteriorating economy, adopted a comprehensive macro reform program (including energy price reform) in 1989, with the support of the International Monetary Fund, World Bank, and A.I.D., that sector project support was resumed. While the International Monetary Fund took the lead with its negotiation of a Stand-by, the World Bank Structural Adjustment Agreement and A.I.D. policy cash transfers strongly supported the reform program.

Whereas power project conditionality was relatively unsuccessful in initiating sector policy reform prior to the macro reform program, it has since contributed to maintaining energy sector policy reform. A.I.D. and World Bank power projects now contain conditions precedent in order to leverage continued progress toward the target of energy prices being equal to long-run marginal cost by 1995.

Telecommunications Policy Reforms

Comprehensive policy conditions affecting the financial performance of ARENTO were included in the 1978 Telecommunications I Project. These specified that by one year from the date of the Loan Agreement (prior to August 31, 1979):

1. ARENTO prepare a tariff rate structure for the 1980-1985 period to be sufficient to cover the costs of future operations, service debt, and to provide an acceptable contribution to capital investment.

2. The Government of Egypt reorganize ARENTO under its own special charter as an autonomous entity, with the following authorities and rights: (1) to establish subsidiary companies able to participate in joint ventures; (2) to establish a reasonable rate/tariff structure; (3) to establish a reasonable wage-rate structure; (4) to be free from Egyptian Government employment quotas; (5) to discharge unproductive workers; (6) to eliminate the ARENTO legal obligation to turn over all its profits to the Ministry of Finance, thereby reducing its dependence on the Government of Egypt budgetary process and gaining necessary operating and investment funds; (7) to appoint top managers without prior governmental approval; and (8) to establish accounting, financial reporting, and inventory disposal systems designed to serve the telecommunications industry, free of governmental requirements.

3. ARENTO revalue its asset accounts using replacement value less depreciation.
4. ARENTO freeze its staff size and adopt a policy that the number of new hires cannot exceed the annual turnover rate.
5. ARENTO transfer LE 20 million owed by ARENTO to the Government of Egypt from a liability account to an equity account.
6. ARENTO maintain a debt-to-equity ratio of 70:30.
7. ARENTO take all reasonable steps to implement the Service Improvement Plan.

The 1979 A.I.D. Telecommunications II project extended the covenants of the first power plant one year to August 31, 1980, and added one covenant to ensure that Government of Egypt organizations make payment for telecommunications services. The Telecommunications III Power Plant extended the date for covenant compliance to January 31, 1981. The 1988 Telecommunications IV Power Plant did not include any CPs or covenants related to policy.

The first three Telecommunications projects (Telcom I, II, and III) *all included the same conditionality*. Even though the reform conditions were not met under Telcom I, A.I.D. continued to provide more funding through follow-on Telcom projects (Telcom II and III). *Some of the conditions were met after 4 years and others took 10 or more years*. The speed of performance was disappointing, but A.I.D. continued to provide new funding even when the policy conditions had not been met. Eventually, most of the reforms were put in place as in the following:

1. In January 1982, a new rate structure was implemented according to the results of a study conducted by ARENTO and a U.S. consultant. Effective July 1, 1985, ARENTO increased telephone subscription rates between 50 and 66 percent. Effective January 1988, ARENTO limited local telephone call duration to 6 minutes and, as a result, expected to generate a 25 percent increase in intracity revenues.
2. The former ARETO organization was formally changed into the autonomous entity ARENTO by enactment of Government of Egypt Law 153 in July of 1980.
3. ARENTO has revalued its assets at present market value.

4. ARENTO under its Law 153 has the right to freeze the number of its employees. However, Government of Egypt regulations sometimes force ARENTO to hire new graduates. As of May 1982, total ARENTO staff had declined from 50,000 to 48,000 employees. However, the staff number increased to 54,265 by 1991, a sign of noncompliance with this particular covenant.

5. The debt/equity covenant was deleted by A.I.D.

6. ARENTO together with the project-financed consultants implemented the Service Improvement Plan.

7. Some progress was made by ARENTO to collect Government of Egypt telephone service bills, although the Ministry of Interior and Defence still have large arrearages.

Implementation of most of the reforms significantly improved ARENTO's financial position. ARENTO is currently collecting sufficient revenue to cover its entire operation and maintenance costs, but not its capital costs.

The cost of domestic telephone service is not yet covered by service charges. As a result, ARENTO must depend on revenue generation from connection fees and international tariffs. Connection fees bear no relationship to actual connection costs. A.I.D. is currently financing a Cost of Service study that will identify appropriate tariffs and user fees and propose strategies for implementation. The study will recommend reforms which, if implemented, will enable the telecommunications sector to operate on a commercial basis.

Water Sector Policy Reforms

The 1977 Cairo Water System Project Paper included several covenants relevant to sector policy: (1) GOGCWS and the Government of Egypt were to review and discuss with A.I.D. the recommendations of the management and tariff consultant to GOGCWS and implement the recommendations agreed to as a result of the discussions; and (2) the Government of Egypt was to ensure adequate long-term financing for GOGCWS' expansion program. The financing was to be divided between equity contributions and loans in order that the debt-to-equity ratio would be no greater than 1.5:1, and that tariffs be set at a level high enough to produce a *reasonable rate of return on average net fixed assets in operation*, appropriately valued and revalued from time to time.

The first project amendment also included a number of covenants requiring the GOGCWS to provide (1) a tariff plan, or some other financial plan, which permits GOGCWS to generate adequate revenues after 1984 to cover, *at a minimum, operation and maintenance expenses and debt service*; (2) a detailed plan to improve the meter installation and reading, bill collection, and meter repair system; and (3) a detailed plan to reduce water wastage.

The water revenue goals were not met during the duration of the project (1977-1989). The A.I.D. Egypt FY 1990 Action Plan found that user charges in 1986 only represented 40 percent of recurrent costs. The recurrent costs for 1989 were estimated to be 10 piasters, with 6.5 piasters for operations and maintenance and 3.5 piasters for debt service. By 1989 the average price of water for all consumers country-wide was estimated to be close to 10 piasters. It was projected that user charges would go to 13.4 piasters in 1991 to cover full operations and maintenance costs, debt service, and inflation. It was noted that meeting this objective could be jeopardized by the large volume of treated water that does not generate income due to leaks, theft, or nonpayment of bills.

While user charges increased 10 percent recently, this nominal rate increase did not translate into a real rate increase because of inflation. As a result, user charges do not cover debt service costs.

Sewage Sector Policy Reforms

The 1984 Cairo Sewerage II Project Paper, and its 1986 second amendment, proposed policy covenants requiring the Government of Egypt to ensure proper operation and maintenance of the rehabilitated and expanded wastewater system. An integral part of this effort involves an annual policy dialogue to review performance of the wastewater sector and future performance expectations. Subsequent to this annual review, the amount of A.I.D. funding for subsequent years is determined.

The Government of Egypt agreed to provide adequate financing of household sewer hook-ups and that the ability of households to pay for sewer hook-up shall not be the sole determinant of whether hook-up actually occurs. It also agreed to raise tariffs sufficiently to cover adequate operation and maintenance of the system constructed under Cairo Sewerage II.

Progress in meeting this objective has been slow. GOGCWS is responsible for billing sewerage charges as part of the water tariff. GOGCWS remits the sewerage portion to Cairo Wastewater Organization, less a 10 percent administrative collection fee. Before July 1, 1985, no sewerage portion was assessed.

Beginning then, a 10 percent sewer surcharge was imposed on all water users. The sewer fee only covered an estimated 10 percent of recurrent costs in 1985, which were defined to include operations and maintenance and debt service. The A.I.D. Egypt FY 1990 Action Plan set a 1991 goal of 50 percent coverage of recurrent costs. While the 10 percent sewer surcharge was increased in July 1991 from 10 percent to 20 percent for residential connections and from 10 percent to 50 percent for commercial and industrial connections, the nominal increases in water fees (the base for the sewer surcharge) did not keep up with inflation. Also, there remains difficulty in bill collecting—success rate estimates ranging from 40 to 90 percent.

Although progress to date has been limited, there are encouraging signs that the pace may pick up. The Cairo Wastewater Organization Cairo Wastewater Organization plans to raise its current 20 percent sewerage tariff on most users to the 50 percent level currently levied on declared industrial users by 1995. A July 1992 A.I.D. funded study estimated service charge levels necessary to achieve operations and maintenance cost recovery for the 1993-1997 period and concluded that a 50 percent surcharge on all users would be adequate, assuming the water collection rate increased 80 percent or more. However, the Cairo Wastewater Organization may have had continued trouble meeting its bills in light of its dependence on the water authority COGCWS to remit the sewerage portion and overall dependence upon the Government of Egypt Finance Ministry for yearly subsidies.

A.I.D. project conditionality has made considerable progress with the sector recovering an increasing proportion of recurrent costs. However, the sector remains dependent on Government of Egypt subsidies and donor financing for its needed capital expansion program for the foreseeable future.

Overall Policy Reform Impacts

Policy reform in the late 1970s and through most of the 1980s was very limited. Conditionality was more successful since 1989, as the Government of Egypt implemented its comprehensive economic reform program with the support of the International Monetary Fund, World Bank, and donors, including A.I.D. Once the overall environment shifted in favor of policy reform, project conditionality became much more successful, though there still is a long way to go. While most sectors are starting to move toward full cost recovery, and telecommunications has already achieved this goal for its operations and maintenance costs, all sectors remain dependent on donor support of their capital development programs.

APPENDIX G

USAID/EGYPT COMMENTS ON THE ASSESSMENT FINDINGS

A Note From CDIE: CDIE Program and Operations Assessments are a unique type of evaluation in A.I.D. They are intended to provide an independent examination of development issues. Assessments are at their best when they critically and thoroughly examine and question all of the assumptions of a development issue. This is particularly important since development is an uncertain, high-risk business, where things can easily go awry.

In the case of the Capital Projects Assessment, the field work covered Egypt. When the evaluation team discussed its finding with the Mission, there were differences of opinion. The evaluation team took the Mission's views into account where it could, but in several cases, where there was still a difference of view, the team had to rely on its own judgment.

Often in A.I.D., documents go through a clearance process designed to build consensus on major issues. However, with CDIE Assessments, because of the need to ensure the objectivity of findings, they are not subjected to the same clearance process. A.I.D. places special emphasis on ensuring the integrity, objectivity, and independence of CDIE evaluation findings. To help ensure independence, CDIE selects skilled professionals for its evaluation teams who are not associated with either the USAID Mission or the program being evaluated. In addition, while Missions are always asked to review the draft evaluations and their comments are carefully considered, especially where issues pertain to the accuracy of facts, their concurrence is not a requirement for clearance.

In order to enable the USAID/Egypt Mission a chance to voice its dissenting views without compromising the evaluation team's own independent assessment and conclusions, CDIE has included this appendix which contains the Mission's views. CDIE welcomes such debate and differences of opinion as an important aspect of the learning process that will ultimately improve our understanding of development.

From the Mission's perspective, the final report represents an improvement over the earlier drafts. However, we continue to believe that the analysis is flawed as discussed in the following paragraphs.

As acknowledged in the CDIE study, the capital projects reviewed by CDIE have made important contributions to the development of Egypt's economic infrastructure. However, the study asserts that the economic rates of return for power and wastewater projects are low and implies that these types of projects should not be financed. We disagree with these conclusions. After careful review of the CDIE study, we believe that

the economic analyses suffer from methodological deficiencies, incomplete information, and inappropriate hypotheses. As a result, the study draws conclusions which contain implications for capital project funding in Egypt and elsewhere which are inappropriate.

The CDIE analyses suffer from methodological flaws. The principal problem relates to measuring economic benefits for power and water/wastewater projects primarily in terms of tariff revenues generated by the projects at the time they were designed, rather than in terms of the value to the consumers of the outputs. This value is measured by increases in energy prices over the past several years. Consequently, the report greatly underestimates economic benefits in an environment—such as Egypt's—where tariffs have historically been highly subsidized, but for which subsidies are being removed. In addition, CDIE's approach ignores a variety of external or secondary economic benefit—such as the downstream benefits of improved water quality or the gains to the economy resulting from reduced power outages—which are important for a number of the projects analyzed. These methodological weaknesses are, in USAID/Egypt's view, the principal explanation for CDIE finding low economic rates of return to the infrastructure projects examined in Egypt which, by its own admission, were well designed and made an important contribution to Egypt's economic development.

The analysis of the Shoubra power plant provides a useful example of the problems with measuring economic benefits primarily in terms of tariff revenues. As a general rule, the economic benefits of a project should be measured in terms of the economic value to consumers of project outputs—as measured by their willingness-to-pay for those outputs. At least three factors demonstrate that economic value was much greater than average tariffs in the case of Shoubra: 1) during the last few years, consumers have demonstrated—in the face of significant real tariff increases—that they value electricity much more than what was assumed in the early years of the Shoubra analysis; 2) the addition of Shoubra to the EEA grid effectively ended capacity-related outages—the costs of which are much higher than tariffs; and 3) most of Shoubra's output does not go to marginal consumption.

In this light, USAID/Cairo reworked the economic analysis of Shoubra using per kwh benefit measures consistent with consumers' demonstrated willingness-to-pay higher tariffs in recent years. The result was an economic return greater than 15 percent, instead of the CDIE assertion of an economic return of 6.8 percent.

Many of these same criticisms apply as well to the CDIE analyses of water/wastewater projects. That is, willingness-to-pay for connected consumers is clearly well above actual tariffs. In addition, there are many external benefits resulting from improvements in water/wastewater services which have been ignored, e.g., health and productivity gains for all urban households, whether connected to the system or not, and downstream benefits in form of improved health and increased agricultural productivity. In light of these problems and omissions, CDIE's estimated economic rates of return and "break even" willingness-to-pay levels are basically meaningless.

The series also utilizes information which should be either more accurate or more complete. An obvious example, the massive Cairo Sewerage Project, highlights serious discrepancies of information which exists. The CDIE study figures that \$139 per household is necessary for payback while the more technical study, recently completed by Ernst and Young, concludes that \$50 per family is necessary. Other technical discrepancies exist: on the water project, the CDIE study uses a per capita consumption of 30 liters per day while water specialists in Cairo estimate 100 to 300 liters per day, depending on the income group. Such discrepancies between CDIE figures and USAID/Cairo's should be resolved before an attempt is made to estimate project rates of return. The nonquantifiable benefits created by the projects, like improved health conditions for millions of people (Cairo Sewerage II) and increased productivity and employment (Shoubra Power Project) are variables which have to be measured before a definitive conclusion can be reached.

The CDIE study is an attempt to prove, or disprove, a set of hypotheses about the relationship of capital projects, development, and trade by retrofitting them onto ongoing or completed capital projects. (If the capital projects had been designed on the basis of these hypotheses, the Mission might have designed and implemented them differently.) The hypothesis of additionality, that a donor's assistance should generate follow-on donor exports, has important variables which need further consideration. For instance, the study and its related piece on trade, assumes a level of spare part provisions for capital projects which is far too high. (For further clarification, the reader should see Mission comments on *Capital Projects: U.S. Aid and Trade in Egypt*, Technical Report No. 8.) Other hypotheses also need rethinking. The theory that capital projects should leverage other donor and private investor participation neither takes into account the numerous USAID and Congressional regulations which limit such cooperation, nor does it examine the regulations of other donor agencies.

It is important to emphasize that this CDIE study was primarily designed to test hypotheses about the secondary impacts of capital projects in generating additional trade. It was not, nor was it intended to be, a comprehensive ex post economic evaluation of the impacts of capital projects in Egypt. As a result, USAID/Egypt suggests that the CDIE series be viewed as a preliminary effort which accentuates the subject's complexity and underscores the necessity of more rigorous research on the intricate relationship of capital projects and development. The Mission plans further studies in this area which will employ a more rigorous methodology, and gather more complete information to analyze the economic impact of capital projects in Egypt. The Mission's most serious concern regarding the series is that CDIE has given such prominent and unequivocal interpretations to the results of these preliminary analyses.



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