

EVALUATION OF THE TECHNOLOGICAL PLANNING PROGRAM

CAIRO UNIVERSITY/MASSACHUSETTS INSTITUTE OF TECHNOLOGY

AID CONTRACT NE-C-1291

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## EXECUTIVE SUMMARY

The Cairo University/M.I.T. Technological Planning Program (USAID Contract NE-C-1291) is evaluated in this report. The Program has coupled M.I.T. expertise in the transfer and adaptation of technology to developing countries, with an Egyptian need to improve their capability to conduct technical, economic and social analyses relevant to project and program development and policy formulation, which would help achieve their development goals.

The objectives of the program are threefold.

- Improve the capabilities of the ministries to perform and utilize relevant analyses'.
- Mobilize academic interest in organizing and expanding investigations focused on specific development projects.
- Assist in the establishment of an institutional framework to become the permanent means by which present and future decision makers are exposed to recent research and field experience in the project evaluation area and programs'.

Individual research projects have been underway for the past two and one-half years and are the major mechanism used by the program to achieve these objectives. The research projects are grouped into four areas, Energy, Manufacturing, Public Works, and Socio-Economic Development. Each project is led by a principal investigator from the M.I.T. faculty, the Cairo University faculty and a representative from the interested ministry. The specific accomplishments of the projects are significant. Many recommendations have already been implemented in Egypt. These accomplishments are described in detail in Part 2 of this report. In addition to the specific results, however, a broader impact upon the development process is evident. Within the context of the projects an awareness of the value of cooperation between ministry personnel and the academic community has developed. Educational opportunities have been provided where a need was apparent and the capabilities of both the faculty and ministry participants have improved as a result. These activities are described in Part 3

of the report

Although the progress of the program toward attaining the first two goals has been noteworthy, the permanency of that impact is dependent upon the achievement of the third goal - the establishment of an institutional framework at Cairo University. At the present time progress has been made in arriving at that goal. The Center for Development Research and Technological Planning has been established at Cairo University. This center is an autonomous unit which has its own bylaws and is free from regular governmental financial and administrative regulations. A director and a board of directors have been appointed. An organizational structure, administrative and financial procedures have been developed. The scope of the Center's interest is broader than that covered in the Cairo University/M.I.T. Technological Planning Program and has the capability to reach all areas related to development plans for Egypt. Additional time and experience with the Center operation will be necessary in order to fully evaluate its contribution.

The enthusiastic results of research projects, and the establishment of the Center indicate that the program has been successful.

## PART 1

## HISTORICAL SUMMARY

In 1971, the Technology Adaptation Program was initiated at M.I.T. under a grant from the Office of Science and Technology of the U.S. Agency for International Development (AID). This Program was created to be concerned with issues involved in the transfer and adaptation of technology to the conditions prevailing in developing countries. Its objectives were:

- to determine the characteristics of technologies that are appropriate to countries in various stages of development;
- to identify criteria for the selection and adaptation of appropriate technologies;
- to develop an understanding of the processes by which technological knowledge and skills can be effectively introduced, disseminated, and used in developing nations.

The Program promotes an awareness of and expertise in the technical, social and economic problems of technological transfer and adaptation of developing countries on the part of both faculty and students at M.I.T., especially including those from developing countries who are seeking knowledge useful to their countries.

The Technology Adaptation Program has conducted a wide range of academic and research activities which have included the following:

- Research projects involving faculty, staff, and students.
- Institutional ties between M.I.T. and universities, government agencies and other organizations in developing countries.
- Educational opportunities at M.I.T. for those interested

in issues of technology adaptation and transfer, including: interdisciplinary master's degree program, research assistantships, curriculum and course development, visits by foreign scholars, travel by M.I.T. faculty and staff, and conferences, workshops, and seminars.

The research activities of the program have focused principally on those developing countries which already have created the basic prerequisites for effective technological transfer and are in the process of developing more sophisticated technical capabilities. The cooperation of Technology Adaptation Program with certain universities and institutions in these countries has provided the catalytic effect required for the introduction of new technology.

A few years following the establishment of the Technology Adaptation Program at M.I.T. diplomatic relations between U.S.A. and the Government of Egypt were re-established. A subsequent commitment to provide substantial economic assistance occurred and numerous high level discussions between the U.S. State Department and Egyptian Officials were held concerning the pressing needs of Egypt. By early 1974 it became apparent to the U.S. State Department that the Government of Egypt's capability to utilize financial assistance, being offered by many foreign donors, was impeded by the lack of projects which had been thoroughly studied and proven to have been technically and economically feasible. A survey of the Government of Egypt capability, conducted by U.S. Government Agencies found that there existed an urgent need to provide high standard feasibility studies, but only a limited capability existed.

By this time the Technology Adaptation Program at M.I.T. had gained valuable experience in the area of assisting developing countries. Many of the general and specific issues addressed in projects sponsored by the Technology Adaptation Program were relevant to the conditions and stages of development in Egypt.

#### M.I.T.'s Proposal to AID

Based upon M.I.T.'s experience a program for Egypt was

proposed to AID. The focus of the proposed program was the application and expansion of the methods of technical evaluation and economic and social assessment of projects and policies which help in achieving development goals.

The specific objectives of this program were defined as follows:

1. To cooperate with the ministries of the Government of Egypt in expanding their capabilities to perform project evaluation analyses, i.e., to accurately identify the technical alternatives and assess the economic and social benefits to be realized in present and future development programs.

These capabilities could only be established effectively if the program focused on development areas and problems which were of current concern. Demonstration of the effectiveness of these techniques and encouragement of the dissemination of related information would be the most effective manner of carrying out this task.

2. To assist in the establishment of an institutional framework which can become the permanent means by which present and future decision makers are exposed to recent research and field experience in the project evaluation area.

This institutional framework would be formalized in a liaison office which could have continuing functions in providing direct and convenient communication between the government ministries, national institutes and academic faculties. Decision makers would therefore have permanent access to a centralized and comprehensive body of technical, economic, and social expertise. Such an organization would actively promote and encourage the use of this expertise much more efficiently than a less formal structure. Although the office would be initially sponsored under this program, its survival would require that it become self-supporting by the end of the program period.

3. To help in mobilizing academic interest in Egypt in

organizing and expanding investigations focused on specific development problems.

Sustained academic interest in development issues are a major contribution to their resolution and are essential to the successful implementation and eventual self-sufficiency of a program. This program would, therefore, assist in establishing the mechanisms by which ongoing national and international research is incorporated into future decision making. Specific development problems would be approached in a joint effort by the relevant ministries and other policymakers in consultation with academic specialists.

Several secondary benefits were expected from the program:

- Information developed in the specific project assessments, as well as the background information acquired would expand the data base for policy decisions.
- The Program would contribute to improved understanding of both the specific and general issues of national development and exemplify the interaction of technical, economic and social issues in project planning.
- The program would expand the educational opportunities of both M.I.T. and in Egypt. Opportunities for learning would be made available for those interested in general or specific problems of developing countries. The projects would provide an opportunity for future decision makers to serve an apprenticeship under experts in particular areas of technical and economic development.

The M.I.T. proposal was reviewed and accepted by AID and in December 1976 USAID contract NE-C-1291 was approved.

#### Actions Taken to Implement the Program

In order to demonstrate the feasibility of the program two critical elements were considered essential:

1. A set of specific projects needed to be organized and underway with clear short and medium range benefits for the ministries involved.

2. An effective administrative and project development organization needed to be established at Cairo University to form the nucleus of the future institutional commitment.

To develop the specific planning projects, a group of fourteen M.I.T. faculty and six program staff visited Cairo in January 1977. They met with potential counterparts at Cairo University to discuss possible areas of collaboration and to identify specific topic areas in which proposals could be developed. The Cairo University and M.I.T. faculty had interviews and discussions with a large number of ministry personnel interested in developing specific projects. The reception given by the ministries to the proposal effort was both positive and optimistic. An initial set of proposals were prepared in Cairo during January and February 1977 and submitted to the Program Executive Committee for review, approval and funding. The requirements for project selection utilized by the Committee were:

- a) Utility of project results for either increasing the efficient use of present resources or developing new projects.
- b) Demonstration of the collaborative nature of the projects, the concept of working with, not for, the ministries, and in particular, the willing cooperation of the ministry planning groups.
- c) Responsiveness to AID's concern for the solution of the numerous planning problems facing Egypt.
- d) Contribute to an improved understanding of technological adaptation and development processes.
- e) Time constraint requiring specific results within one year.

The following guidelines were also followed:

- a) Demonstration of an organized planning methodology.
- b) Projects of the highest priority to the ministries consistent with Cairo University and M.I.T. staffing constraints.

- c) Active role for all three sets of participants.
- d) Relevance to ongoing and planned projects within Egypt.
- e) Potential for expansion in the next phase into a more general planning framework for the ministry involved.
- f) Potential for contribution to the framework for the establishment of the Institute for Technological Planning.

#### Administrative and Financial Organization of the Program

During the first few months of the program, and as a parallel effort to the creation of project teams the administrative and physical organization of the M.I.T./Cairo University program was named Technological Planning Program and its organizational structure is shown in Figure 1. Facilities for the Liaison Office were provided in the Faculty of Engineering of Cairo University and renovations were begun in January 1977. An Executive Committee was established at Cairo University to oversee the operation of the program. An M.I.T. administrator was selected and assigned to be the sole permanent M.I.T. Technology Adaptation Program representative in the office. The office was established by an agreement between M.I.T. and Cairo University which is contained in Appendix 1 to this report. In the area of financial planning and control, the M.I.T. Office of Sponsored Programs and the M.I.T. Comptroller's Office developed a set of documentation requirements and reporting procedures for the administration of the Liaison Office. These comply with M.I.T.'s normal accounting practices for government sponsored research projects. The Liaison Office was organized from the standpoint of financial administration as an M.I.T. field office, reporting directly to the M.I.T. Comptroller. All original documentation is returned to M.I.T. by the field office. All financial reporting to AID is through the M.I.T. Comptroller.

#### Evaluation of the Program

The technical content of projects selected for collaboration, and the organizational and administrative procedures which were established in early 1977 provided a basis to assess the feasibility

## Administrative Organization of the Technological Planning Program (TPP)

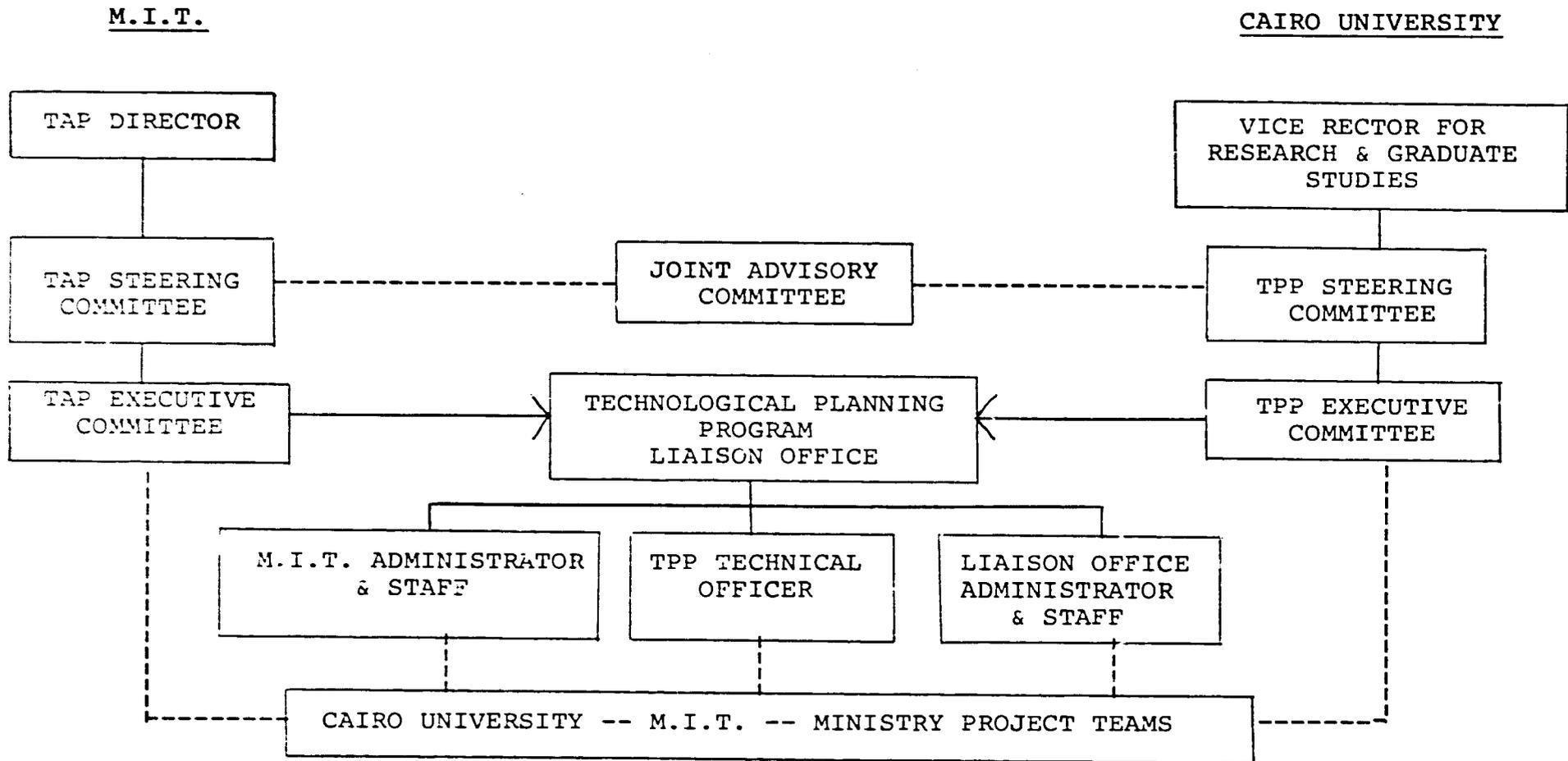


Figure 1

of the program during the first phase (December 1976 to June 1978). The effect was favorable evaluated by AID and was enthusiastically supported by and participated in by many Government of Egypt ministries. Eleven studies and numerous training programs and conferences had been carried out - the results of which are being utilized by Government of Egypt ministries in program and project development activities. As a result, a second phase effort was approved which is directed toward developing and institutionalizing Egyptian capabilities by a continuation, over the succeeding five years, of M.I.T.'s involvement. The first two years of this new phase were financed by an extension to the original contract. The remaining three years of the program's funding is contingent upon an evaluation of the program.

In preparing for this evaluation an Evaluation Plan was prepared, submitted and approved. A copy is contained in Appendix 2. The procedure for the conduct of the evaluation which was agreed upon is as follows.

- Preparation of detailed evaluation design and measures. M.I.T. prepare the initial draft. Cairo University and USAID review and suggest changes if appropriate.
- Following the agreed upon evaluation design, M.I.T. prepare the basic evaluation report that would analyze and report on progress and problems of the project.
- USAID draft an assessment of the above evaluation report. A brief summary of AID financial inputs and implementation concerns to be prepared by USAID.
- With the above information as background and supplemented with additional discussions in Cairo and at M.I.T., AID/Washington will carry out an evaluation review of the project and draft a brief supplementary report.

## PART 2

## INDIVIDUAL RESEARCH PROJECTS

The major implementing mechanism used in the program was the creation of a number of individual research projects. Through these projects the goals and objectives of the program were addressed. In Chapter 1 of this part of the evaluation report the projects are described. These descriptions provide the objectives of the research, the accomplishments achieved, and the future directions anticipated. Chapter 2 provides detailed examples of the impact the projects have had toward meeting the program objectives of mobilizing academic interest and the impact on the research within the ministries.

CHAPTER 1. PROJECT DESCRIPTIONS

## Initiation of Projects

A general framework for the program was defined in terms of program objectives and the analytic approaches considered feasible for this effort. Three general approaches or orientations to specific projects were utilized.

1. Engineering analysis and technical project evaluation would address specifically technical issues, including field and laboratory studies, design, training requirements, etc.
2. Economic analysis would focus on project, sector and national planning issues, micro- and macro economic studies related to specific Egyptian development programs, and educational objectives.
3. A social science approach to development programs which focus on overall policy formulation, and specific projects in population planning, rural development, social service, technology transfer strategies.

Concern was initially expressed by AID regarding the quality and relevance of the research topic areas to be developed. Previous academic-based assistance programs had often developed

projects relevant to the researchers' academic interests but not necessarily of immediate utility to the sponsor. Care was taken, therefore, in assuring that approved projects would bear directly on problems of current concern to ministry planners. In responding to this concern, a number of specific actions were taken at the start of the program. Following the visit to Cairo in January 1977 by the M.I.T. group, fifteen proposals were submitted to the program Executive Committees. Nine of these were funded initially with four more approved later. The major constraints on their selection, that they focused on issues of current concern to the ministries and that specific results and recommendations be produced within one year, have insured that the projects approved provide a clear illustration of academic commitment to Egypt's development planning. Additionally, the commitment of senior faculty from both M.I.T. and Cairo University is considered crucial in demonstrating the feasibility of the program and meeting the objectives of the program. Twelve full professors from M.I.T., including one present and one former department head, two associate and two assistant professors were active participants in the initially approved projects. The majority of these faculty members brought their experience in working in developing countries to their projects. From Cairo University, sixteen full professors were on the teams.

As each project was approved, the proposal was reviewed by the appropriate minister and his staff, and ministry personnel were appointed to supervise and participate directly in the project activities. Most projects, in addition, have junior level ministry personnel actively involved and assigned specific tasks. Some act as principal data collection agents; others are responsible for operating computer-based and other planning techniques being developed.

Based upon contacts and discussions in Egypt, the resources available at both M.I.T. and Cairo University, the topic areas which appeared to offer the most rewarding opportunities for locating projects and achieving the program's objectives were focused in the following four broad areas:

1. Energy - including electricity generation and distribution.
2. Manufacturing - including small scale industries, plastics and building materials.
3. Public Works - including housing, transportation and water resources.
4. Socio-Economic Development - including migration, health care deliver; macroeconomic planning, and rural communications.

The individual projects, their principal investigators and senior ministry officials are listed in Appendix 3. The description of each project is as follows:

#### ENERGY

##### Long Term Investment Planning for the Egyptian Electric Power System

The objective of the project is to provide Egypt with trained personnel and modern techniques for the economic assessment of electric power generation, transmission and distribution. The Ministry of Electricity is confronted with the task of selecting projects from a wide range of options. The technical staff of the Ministry is well trained in the engineering aspects of the alternate projects, but is less conversant in modern techniques for economic assessment.

The methodology of the project has been to identify specific electric power problem areas in Egypt, then organize research groups for their investigation consisting of senior and junior members from CU (Cairo University) and MoE (Ministry of Electricity and Energy) under the supervision of principal investigators from CU, M.I.T., and MoE who define the research strategy. The basic philosophy agreed to by all participants is to start by building simple practical models, feeding them data, and analyzing the results. Then the models are made increasingly complex and elaborate to incorporate more features of reality. During this process, talent and experience is developed among personnel at CU and MoE.

The bulk of the project work has been initiated by suggestion of MoE, and carried out by the CU team with substantial participation of Ministry personnel. Data collection has been conducted by both teams, and has led to an appreciation of the need for data base management. The MoE is enthusiastic over the results of its collaboration with CU and M.I.T., and CU personnel have made significant progress in terms of management and technical abilities.

In July 1977 several meetings were held in Cairo attended by participants from CU, M.I.T., and MoE to discuss implementation of the agreement concerning the study of long-term investment planning. A research strategy was proposed which consisted primarily of two projects; a preinvestment survey for investment planning, and a study of the optimum mixture of power station types for variable demand. The first project involved a cost benefit study of specific power generation options, including hydroelectric, thermal, and gas turbine. The basic problem of the second project was to choose, given the pattern of demand fluctuations, the most economical mixture of power station types between steam generators (high fixed costs, low variable costs) and gas turbines (low fixed costs, high variable costs).

The first two projects were concluded in July 1978. The results of the first project are summarized in "Investment Criteria for Lumpy Capacity Expansion" by M. Weitzman, and in a CU-M.I.T.-MoE joint paper "Preinvestment Survey for Capacity Expansion". The recommendations were highly credited by MoE, which has been using the results in a more detailed generation expansion program currently available on computer. Results of the second project are given in a paper entitled "Optimal Mixture of Steam and Gas Turbine Power Plants".

In September 1978, the electric power project entered the current phase, planned to run until August 1980. Three new projects were inaugurated; 1) application of power systems reliability evaluation methods to Egypt, 2) a comparative study of the economics of rural power distribution alternatives, and 3) a study of optimal distribution power line configurations.

The reliability study is aimed at calculating for Egypt the probability that complicated electric power systems will

break down, and analyzing the economic design and operation implications. Early during the project on reliability a seminar taught by members of CU and MoE was held on applications of probability theory to reliability analysis. This was beneficial, for in the past there had been essentially no attention paid to probabilistic systems in the engineering curricula in Egypt. The seminar was attended by thirty-three people from CU and MoE, and course notes are available. By the present time, three computer programs describing breakdown probabilities for different combinations of system elements have been written in Cairo and tested. Interim reports have been presented. Work is proceeding on the extension of the models to more cases, and to the incorporation of the reliability models into the other projects. To date, the project on reliability has improved the acceptability of pre-packaged algorithms using reliability analysis at the MoE.

The rural project has concentrated on an economic assessment of one-phase versus three-phase distribution. This project has completed a study of a number of villages in different regions of Egypt to determine the possible adaption of the American single-phase system to rural distribution. A complete cost-benefit comparison between a number of three-phase and single-phase designs was conducted in each case. It was discovered that the present system is far from optimal. The study has been received positively at the MoE. Among further topics to be investigated by this project in its final year are use of three-core cables versus single-core cables in rural areas, algorithms for initial estimates of design parameters in villages undergoing electrification, and optimal routing of rural subtransmission lines.

To date, the project comparing topologies of urban power line configurations has completed a study of four or five options for network systems in Cairo. The Cairo study has led to an understanding of what network connections can be most economic in view of projected expansion and equipment replacement requirements, and in consideration of voltage levels, equipment loading, energy losses, and service continuity. Some of the work to be completed concerns: development of an algorithm for optimal substation placement, system reliability analysis, and study of additional

network possibilities using other available switching equipment.

In view of the progress to date, the Ministry of Electricity is very interested in a continuation of cooperative study in the 1980's. Project participants, especially senior members of the MoE, have suggested several areas for study. An especially urgent need is a revision of the present Egyptian electrical tariff structure. The MoE is very aware of the need to adopt a rational approach to tariff making in the present era of expensive energy. In response to discussion with other project participants, M.I.T. investigators are drafting a simple model for tariff structure based on true marginal costs. The model is expected to be a basis for further studies in Egypt of electricity rates and tariffs.

Other areas of interest also exist. Developed countries are adopting simplified levels of voltages between generators and consumers, and it is felt that investigation of such schemes would be worthwhile in Egypt.

Hydroelectric power generation at High Dam and Aswan, which provides more than 50% of Egyptian electric power generation, is constrained by irrigation requirements and considerations of system stability. In view of the essential role played by hydro power it is essential to understand better the tradeoff between irrigation and energy needs, methods of stabilizing lines, and other factors.

The MoE has expressed interest in studying the economical and technical feasibilities of interconnecting Egypt's power system with those of neighboring countries. Such interconnections usually lead to economies of scale and smoothed customer load demands. Such a study would both be benefited by and be another basis for Middle East political stability.

Other studies have been projected, such as optimal electrification of new industries and cities in developing regions, non-conventional sources of energy, and optimization of power transmission routes.

## MANUFACTURING

### 1. Plastics Industry

#### Mobilization of Academic Interest

The objective of this project has been to strengthen the area of Engineering Plastics technology, which is of obvious relevance to economic development in Egypt. M.I.T. and Cairo University participants collaborated closely with a number of public sector and Government establishments in the solution of a variety of problems. Competence in the field of Engineering plastics has progressively developed at Cairo University through involvement in industrial R & D, the development of laboratory facilities, the acquisition of a Plastics Library and visits to M.I.T. and industrial units in the United States.

Studies are undertaken by forming a group of 2 or 3 members who collaborate on the fulfillment of a given task. This may be either initiated by the project because it is believed to be relevant to the scientific infrastructure of plastics technology or requested by industry. Detailed reports are prepared and presented to the interested establishments.

Both new studies and expansions of those initially started have taken place by the own nature of the project. Emphasis was placed, initially, on two major products important to the national economy; namely PVC pipe for water distribution and P.E. film for fertilizer bags. The project activities have expanded to embrace other products e.g. corrugated PVC drainage pipes, collapsible blood and IV solution containers etc.

The results of the studies undertaken by the project are generally applied in a constructive manner because they are in most of the cases requested by the Ministry of industrial organization involved. Organizations for which studies have been prepared on request include the Petrochemicals Project, the Egyptian Public Authority for Drainage projects, El-Nasr Pharmaceutical Chemicals

company and the pharmaceutical packages company.

The selected studies are of immediate relevance to the strengthening of plastics technology. They cover the areas of Standard applications for raw materials and end products, testing and quality control, training and Industrial R & D promoting design with plastics.

The objective of promoting Engineering Plastics has been clear to Egyptian planners all the time. The role of the project has been to strengthen the area of plastics technology both at Cairo University and in Industry.

Engineering Applications of Plastics is still a new field in Egypt; there is no set government program for its promotion up till now. The Cairo University/M.I.T. project has demonstrated the importance of a sound scientific infrastructure and several governmental authorities are starting to depend on the group for consultation.

## 2. Government Impact on Small-Scale Industrial Development in Egypt

The principal objective of this project was to analyze the ways in which government policy encourages or discourages innovation and growth in the small-scale private industrial sector in Egypt. The underlying rationale of the research that if the obstacles to the expansion of the small private industrial sector were removed, increases in its production, its productivity, and its employment could be achieved that would increase the revenues of low-income groups in the population. The small firms studied were those that employ one hundred or fewer workers (though the census definition of small scale industry is nine workers or fewer). The policies analyzed included a wide range of legislation: fiscal and social insurance taxes, laws on incorporation, price controls, import regulations, the impact of the various bureaucracies that deal with small businesses on those firms' incentives to expand were studied. The tax administration, the banks that lend to small business, the cooperatives, the government control agencies are all institutions that deal regularly with small business and shape the environment in which decisions about growth are made.

This project was not approved beyond its first year because the styles of the principal investigators did not mesh. Although considerable interest in the problem of Small Scale Industries exists in Cairo efforts to find new principal investigators have not been successful.

### PUBLIC WORKS

#### 1. Housing and Construction

The overall objective of the research on Housing and the Construction Industry is to provide a set of pragmatic recommendations/guidelines for the public agencies concerned with housing and to construct a methodology through which these agencies can organize and monitor performance in this sector.

The research intends to develop the technical and economic basis for a national housing policy. Specific recommendations are to be developed with focus on investment policies, controls and regulations, provision of services, and other instruments of government intervention in housing. The goal is to assist the Egyptian government in developing a housing policy which better enables the various supply institutions to meet the country's housing needs.

Several specific problem areas were identified during initial exploratory research:

1. Public Policy and the Economics of Housing, with focus on investigating policy options affecting housing;
2. Organizational and Institutional Issues, with focus on the relative roles of the public and private sectors;
3. Materials and Techniques of Construction, with focus on utilizing indigenous materials and available skills;
4. Housing Construction Systems and Design Norms: Prefabrication, with focus on modifications of the new prefabrication systems required to reach lower income groups and to make better use of the elements; and
5. Housing for the Low Income and Informal Sectors, with focus on site and services planning approaches, compact physical development models, and core house options as an alternative to existing public housing models.

A brief summary of each follows.

#### Public Policy and the Economics of Housing

In its first year, most of the resources were devoted to the collection of data and to the conceptualization of exactly what comprises the housing "problem" in Egypt. The second year saw a substantial shift in emphasis. While some data collection continued, most of the effort was put into evaluation, analysis and some tentative policy recommendations. The results of this preliminary analysis-recommendation phase were extremely encouraging for several reasons. First, the subproject staff developed an

understanding of the Egyptian housing market and its concurrent problems that is substantially deeper and more thorough than previous efforts. Secondly, the empirical evaluation of certain specific problems has produced some written work of considerable interest to the Egyptian Ministries. Thirdly, the Egyptian members of our staff have developed a liaison with the Ministries which leads us to believe that our ideas and recommendations are, and will continue to be, carefully listened to and considered by the highest government officials.

The subproject is now focused on four broad areas:

1. Research on building material market and on the price regulation of building materials, especially of cement.
2. A comparison of the social costs of several technologies available for housing construction.
3. Specific research on the effects of housing market regulation and design of alternative housing policies.
4. Continuing research to develop a general simulation model of the Egyptian housing economy.

#### Organization and Institutional Issues

Building materials, manpower, capital, and land are critical to the provision of shelter and other constructed facilities. The institutional framework, including the managerial/organizational structures and regulatory institutions, internal and external to the housing and construction industry, is responsible for combining these resources in order to satisfy demand. It is these aspects which constitute the long-term focus of this research area.

Research lies in three basic areas: (1) brief survey of the existing situation; (2) identification and investigation of particular aspects in need of change and potential means of accomplishing this, drawing upon experiences of the industry elsewhere; and (3) recommendation of appropriate changes and mechanisms for their achievement. The relative roles of the public and private sectors in housing and construction are of particular interest, in terms of how to encourage the private sector's

development and increase its contribution to the industry in line with Egypt's need for increased construction capacity. The longterm goal is to develop specific and detailed recommendations entailing significant structural suggestions for change, identification of mechanisms for their achievement, and evaluation of their impacts on overall industry operations.

A preliminary state-of-the-art review of the construction industry in Egypt is now completed. The historical development of the construction industry and its importance in national development are discussed as a background/justification. The main body of the report investigates the various participants and their interactions, the role of the government, and the ever-changing regulatory environment within which the industry operates. This culminates in the identification of issues facing these various participants and the future development of their industry. The further investigation and possible resolution of certain of these issues will be the future focus. The information, observations, and impressions presented have been collected largely from interviews and discussions with various participants in the construction industry and personnel in numerous government agencies and offices dealing with the industry, as well as from some of the explicit laws and regulations governing its operation and a limited number of printed/published items on the industry.

#### Materials and Techniques of Construction

The overall objective is to utilize indigenous materials and available skills to the fullest possible extent. Following an initial survey of materials of possible interest to the housing project, activities were narrowed to research in gypsum, foamed slag as a lightweight aggregate, and stabilized earth, in addition to considerations given to coatings, flooring, and the utility infrastructure.

The principal research centered on gypsum. Following a review of applications in other countries, gypsum industry in Egypt, formerly-produced gypsum panels, and future plans for

Egypt, a program was carried out at Cairo University concerning (a) properties of gypsum, (b) water-gypsum ratio, (c) preparation, (d) retarders, (e) addition of lightweight beads, and (f) foaming. Gypsum blocks and panels were prepared. Native and synthetic reeds and fibers and steel mesh were investigated for reinforcing gypsum.

Basic information respecting the practice of stabilized earth was assembled, particularly in its use for roads and as a building construction material. Similarly, basic information on lightweight slag aggregate was assembled.

Information was also compiled on protective and decorative coatings, and on flooring materials. Finally, in preparation for possible future research and more detailed study, a summary on the utility infrastructure, with emphasis on water supply, sewage disposal, and paving, was prepared.

#### Construction Systems and Design Norms: Prefabrication

After concluding the initial fact-finding phase during 1977 and 1978, which dealt with the evaluation of the status and prospects of the eleven prefabrication factories purchased by Egypt in Europe, and after establishing the direction for the development of a more realistic approach to norms and standards (trade-off based), it became clear that the most pressing problem facing the prefabrication industry was to effectively utilize their existing facilities and potential for the solution of the low-cost housing problem, without having to radically modify, or even abandon, the inherent efficiencies and advantages of mass-production offered by this technology.

It was found that the currently proposed solutions of all the factories are too expensive to be considered as feasible candidates for an adequate low-cost housing supply in terms of available resources and/or realistic subsidies.

Thus, it was decided to focus the research on solutions which would result in modest to significant savings of (1) expensive (imported) materials, such as cement and steel, and (2) overall unit cost by carefully assessing trade-off possibilities between

stage of completion, size, level of finish, and/or equipment. The approach is based on the so-called "support-infill" idea, which by means of formal analysis and design allows the hierarchical articulation of all functions in terms of "essentials" (i.e., "support") and secondary elements (i.e., "infill"). Both structural elements and subsidiary partition/finish/equipment elements were subjected to detailed technical and design analysis, resulting in a carefully staged sequence of alternative plan solutions of variable size, stage of completion, finish, equipment, etc.

### Housing for the Low Income and Informal Sector

The housing for the low income study is focused on the rapidly expanding urban areas, with particular concern for the vast informal settlements surrounding the cities. This research is directed toward development of alternative physical planning models to replace existing public housing practices. The "informal development" process is the primary basis for development of compact urban models, but the investigation also includes the appropriate involvement of the private sector. Focus is on the physical planning (site development, utilities, and dwellings).

In the first phase the attempt was to identify/verify critical housing issues. A survey was undertaken of several representative low income areas, and tentative conclusions and comparisons were presented. The intent was not to provide specific detailed information but only to identify major directions for future research.

In the second phase the attempt is to delineate basic principles and physical planning concepts appropriate to the current Egypt situation.

The stress is on the physical layout/land planning aspects, and the design aspects of the dwelling. Appropriate materials, the impact of the guidelines in terms of the whole economy considering labor, materials, and land, and the overall organizational issues of the housing are dealt with in the other sections.

Suggested physical planning guidelines are developed with consideration for administrative, political, social, and economic reali-

ties. Brief guidelines are included for these other aspects to indicate their interrelation and implementation.

In summary, the guidelines suggested are in the context of the low income majority of the urban areas. It is advocated for the government to limit its involvement on the provision of lots with only basic, essential utility services and to allow and encourage expansion/upgrading of the lots as the resources and demands of the users warrant. Only limited use of core shelters are advocated in particular situations when there are advantages for the overall development.

### Intercity Transportation

Patterns of use, system performance, and costs within a transportation network are strongly influenced by policy decisions dealing with levels of transportation investment, operating conditions, or market behavior. Despite this relationship, however, the need for an explicit and comprehensive transportation policy is in general not appreciated in many Third World countries. Often the argument given is that no transport policy structure exists; therefore there is no need to worry about its implications.

The truth of the matter is quite different, albeit not always easily identified or clearly understood. The fact that an explicit transportation policy does not exist does not imply the total absence of such a policy. At the very least, an implicit policy will always be present defined by the collective effects of public and private actions in the service, pricing, regulatory, tax, or subsidy areas. The observed distributions of passenger and commodity flows within a network then reflect the user response to this implicit set of policies.

In the absence of more formalized procedures for policy planning and evaluation, it is likely that policies affecting the transportation system may conflict with one another, produce undesirable side effects, or fail to achieve intended results. The provision of transportation services therefore becomes inefficient as characterized, for example, by misallocations of resources or distortions of price, tax, or subsidy structures.

The purpose of this research is to take a first step toward addressing these difficult problems. We have proposed to design, build, and apply an analytic procedure for predicting transportation policies. Whereas previous transportation planning efforts in Egypt have been confined to the analysis of urban passenger travel, virtually no attention has been given to intercity travel or to freight transport. This project therefore complements earlier efforts by considering both passenger and freight transportation for the intercity modes of highway, rail and inland waterways.

The development of such a methodology entails several interrelated areas of investigation in the engineering, economics and operations research disciplines including:

1. A review of the type of policies affecting intercity transportation, and identification of those that could be represented within a transportation model.
2. For those policies selected above, specification of exactly in what ways the policies affect transportation performance and costs (e.g. improvement in reliability through investment or maintenance; reductions in travel time due to investment in new construction or new technology; changes in user-perceived costs due to tariff changes; and so forth).
3. Design and development of analytic models to capture policy-sensitive shifts in intercity modal choice, performance and costs on the highway, rail and waterways networks.
4. Definition of measures to evaluate the impacts of different policies in terms of user utility, economic efficiency, financial costs and system performance.
5. Assessment of data requirements, data collection, and calibration of models to the current Egyptian situation.

During the first year's research we have completed the conceptual design of this model in the individual areas above. During the coming year's work we hope to consolidate these efforts within a unified model design, code the model in computerized form, and apply it in a case study of the Egyptian situation. The end product of this research will be analytic tool that can be used by the Egyptian Ministry of Transport to (1) investigate the relative costs and benefits of future transportation policy decisions; (2) to gauge the interaction among different policies

in affecting transportation outputs, and thus (3) to provide a more comprehensive approach to transportation policy planning and evaluation.

### 3. Cairo Urban Transportation Project

Members of the urban transportation project have aimed their efforts at accomplishing three major tasks in the area of technology adaptation: (1) Identifying key urban transportation problems to be addressed by the research team. The initial statement of problem areas should not be constrained by the existence of engineering and planning methods created for use in developed nations. Direct applications of such methods in cities of developing nations is often inappropriate and can divert effort away from more pressing problems. (2) Establishing a data base to determine present travel patterns in Cairo. These data bases are used both to help diagnose key problems and as inputs to models that are part of the analysis procedures. (3) Adapting existing planning tools and developing new ones to address the problems identified previously. In this process special attention must be given to the data and resource requirements of the models as well as the cultural, institutional and economic constraints on their use.

#### Identifying Key Problems

Some of the most valuable experiences of this collaborative effort have come in the area of problem definition. For example, in the United States most transit research focuses on the problem of how to increase transit ridership. In Cairo, where 80% of vehicular trips are made by transit, and buses normally operate with three or four times the number of passengers found on buses in the U.S., attracting ridership is not a relevant problem. Given the scarce resources available and the present saturation of transit capacity, two problems identified for primary consideration have been the more efficient use of existing transit resources, and a process for defining the best short run investments in the sector.

The second problem identified is that of future auto ownership levels. Rates of auto ownership are of less interest in industrialized countries because auto ownership is already widespread and is less controllable than in a country like Egypt. In Egypt, it is an important variable when considering the future of the urban transportation system. Changes in the level of import tariff or in the expansion plans of the domestic automobile industry, for example, could make substantial impacts on auto ownership and hence on the need for highway and mass transit investments. Hence the prediction of future levels of auto ownership under a range of government policies towards auto production, imports, and pricing has been identified as an important problem.

A final question of great importance is the programming of transport investments. The aim here is to develop a procedure which can be applied in Cairo to identify priorities among alternative projects to ensure most effective use of resources.

#### Establishing a Data Base

Two major surveys have been conducted to provide the data needed to effectively address these problem areas. The first was a large-scale traffic survey of the greater Cairo area conducted in April 1977. This survey provided information on traffic volume characteristics on major roads and streets, and has been compiled to give detailed information on origin-destination movements by vehicle type and hour of the day. In conjunction with this survey, a detailed inventory of the road network was undertaken as well as a study of travel times on representative roads. These data are being used to calibrate models used in studies of travel demand forecasting, auto ownership, transportation facilities programming, traffic management schemes, and parking; thus, they are a cornerstone of much of the work presently being conducted.

The second major survey, conducted in April 1978 obtained information on public transport passenger movements equivalent to that of the traffic survey. This data provided necessary information for research in the area of transit improvements and determination of

benefits and costs.

The major focus of the urban transportation project to date has been the development of a procedure for programming transport investments in Cairo. The final product of this research community in Cairo as well as the Ministry of Transportation for the continual evaluation of project priorities. "Programming", in this specialized sense, is a methodology by which alternative investment sequences are evaluated from a wide range of perspectives.

The first subtask under project programming was to gain an understanding of the decision-making process by which transportation projects move from conceptualization to final implementation. Because of a change in the structure of local government which significantly increases its role in the planning process, recently completed research concentrates on the local government level. A prototype project programming procedure also has been completed. Present work in this area is concentrated on the economic and functional evaluation of sets of proposed transportation facilities. With the forthcoming completion of the test runs using the project programming procedure, research will focus on a critical appraisal of the work in Cairo.

#### Developing Tools for Analysis and Planning

One important technical task which is being used in the programming effort is the development of a trip assignment model. Data from the traffic and transit surveys have been prepared as inputs to this model, and the road network has also been encoded. The Cairo University (C.U.) team has also completed a study to adapt the assignment model to the special speed and delay characteristics of Cairo's streets.

One version of the assignment model is presently being calibrated at M.I.T. and will be ready for use in the very near future. After a frustrating effort to mount a similar version of the model on a computer in Cairo was abandoned, it was decided that a new improved version would be designed by C.U. according to the team's own specifications. This model represents a significant

improvement over the version at M.I.T. since it will include the capability of modelling important aspects of the Cairo roads which are unique to cities of developing nations. In addition, this version will make possible the analysis of different parking policies, a feature which has not previously been included in any assignment model. Design of this model has been completed and is presently being tested. Other models presently being developed to be used in conjunction with the trip assignment model for the purpose of future travel prediction are a trip generation model and trip distribution model.

The degree of congestion on Cairo streets is greatly affected by the level of auto ownership. This, in turn, is greatly affected by such factors as import tariff, foreign exchange, foreign investment, and plans of the domestic auto industry. To determine the effects of these and other economic and policy variables on auto ownership and to make it possible to predict future auto ownership for work in travel demand forecasting and project programming, a linear programming model of the supply side of the auto market has been formulated and calibrated. Future work in this area will be devoted to improving upon the assumptions made in this first model and formulating a second model of auto ownership based on demand considerations.

Considerable effort is now being given to developing new approaches to identify improvements in the transit system. The purpose of these procedures is to more efficiently utilize existing transit resources using information gathered from the transit survey of 1978. Procedures developed to date deal with the allocation of buses among routes and the creation of new direct, express, and local bus services. These are now being tested and applied by C.U. and the Cairo Transportation Authority. The next phase of this research will concern low capital investment strategies analyzed at the level of sectors of the Cairo transportation network, or transportation "corridors", and development of a bus monitoring program to provide better information to transit management on a continuing basis.

Closely related to this work on transit improvement is new research to determine the incidence of benefits and costs of transit services, which will subsequently be used to refine the methodology

for evaluating proposed changes in transit services. Data is presently being collected for the first phase of this research.

#### 4. Water Resources

##### 4a. Regional Groundwater Studies in Egypt

The two largest groundwater reservoirs in Egypt lie beneath the Nile Delta in the north and the desert to the west and east. Both are among the largest freshwater underground reservoirs in the world and are an important resource in the future of the Egyptian economy.

The Nile Delta reservoir is over three million acres in extent with eastern boundaries near the Suez Canal and western boundaries well into the desert. It fills a vast underground bowl situated between Cairo and the sea. If it weren't for the presence of a saline wedge of seawater along the bottom of this bowl, the Nile Delta aquifer could be easily exploited for the best interests of Egypt. But the threat of salt water intrusion has limited pumping of this aquifer to one billion cubic meters per year, equivalent to two percent of the annual Nile flow.

The desert Nubian Sandstone aquifer, recently called the "largest underground water reservoir in the world" (Al-Ahram, September 2, 1977), has been the subject of a long study by the Egyptian government. Its water is a prime requisite to the development of the desert. This vast reservoir is believed to be recharged in the border area of Egypt, Sudan, Libya, and Chad. From there the water flows north and east toward the oasis at Kharga, Dakhla, Farafra, and Bahriya. These are, historically, nothing more than low points in the desert from which springs rise with their source in the western desert aquifer.

To aid the Government of Egypt in the development and management of these aquifers, two regional studies are underway. Both studies involve the use of numerical aquifer models.

For the Nile Delta aquifer, the regional study is being conducted in cooperation with the Groundwater Research Institute of the Ministry

of Irrigation. The study is focussed on an evaluation of the aquifer's safe yield, its ability to serve as a seasonal storage reservoir for water released from the High Dam, and its interaction with irrigation and drainage activities. The result of the study will hopefully lead to increases in water availability, drainage improvement, and possibly, an increase in power generation at the High Dam due to the availability of downstream storage.

In the Nubian Sandstone aquifer, the study is being conducted in cooperation with the Desert Irrigation Department of the Ministry of Land Reclamation. The purpose of the project is to synthesize information within the basin, to examine the interactive effects of projects, to provide boundary conditions for individual project analysis, and to direct future field exploration efforts toward those data most important for predicting aquifer response to proposed exploitation schemes. This work is a natural outgrowth of the more localized modeling and data collection efforts of the Ministry and other agencies. The primary long term benefits to be derived from such an effort will be a comprehensive study that ties together myriad previous programs and efforts, and points to those areas requiring additional attention, while improving the chances for successful development of water resources in this region.

#### Nile Delta Aquifer

The development of groundwater resources in the Nile Delta requires a close examination and quantification of the positive and negative impacts of the development. Pumping will certainly improve agricultural drainage and increase water availability in the short term. The aquifer can even be used for annual storage, if water can be recharged and withdrawn from the aquifer in reasonable amounts of time. But these developments come with a cost that is only partially economic. The main cost is environmental: the increased threat of saltwater contamination due to sea water intrusion. This has been the motivation for the development of both analytic and numerical models of the aquifer. These models are designed to assess the impacts of the proposed schemes, especially the impact on sea water intrusion.

Three types of models have been employed. Simple analytical models of seawater intrusion have been used to understand the physics of the aquifer, and to make preliminary assessments of intrusion potential. A finite element model of groundwater flow called AQUIFEM, which ignores the presence of the seawater, has been used to identify aquifer parameters and to assess the ability of the aquifer to yield or accept large quantities of water. During the past few months a new finite element model, called SWIM, of groundwater flow and sea water intrusion has been completed.

Future research will concentrate on the application of this new model to the Delta, with greatest concern for the evaluation of the use of cyclic storage in the aquifer. Particular objectives are:

1. Completion of a current preliminary analysis of sea water intrusion and groundwater flow,
2. Implementation of SWIM on Egyptian computer facilities,
3. Use of AQUIFEM and SWIM to evaluate aquifer development schemes.

#### Nubian Sandstone Aquifer

The Nubian Sandstone Aquifer has supplied water to the desert oases for hundreds of years, from natural flowing springs, and from hand drilled wells: the system was in apparent equilibrium. In the early 1960's a drastic change occurred. Many large capacity wells were installed by the government. Withdrawals increased dramatically, and water levels started falling, decreasing natural outflows. The water level decline continues today, and new developments are planned. This is the motivation for a regional study of the aquifer.

The available data describing the aquifer is concentrated in the oasis area, called the New Valley. Most of the aquifer is unmonitored and untested. There are hundreds of square miles of desert overlying the aquifer, where not even a single observation of the aquifer is receiving recharge to the southwest, or if the aquifer is still undergoing a long term transient response to the alleged pluvial period of 18,000 years ago. This lack of information

about the aquifer is the motivation for a study based on uncertainty principles.

In response to these motivations a computer model of groundwater flow has been developed, that accounts for uncertainty of information: parameters, inputs, outputs, boundary conditions, etc. The model provides not only an estimate of the state of the aquifer (e.g., piezometric head), but also the reliability of that estimate. Decisions can now be made that recognize the reliability of predictions explicitly. Data collection programs can be redesigned to obtain that information that gives the greatest improvement of reliability. Presently, simple applications of the model have shown the importance of these reliability estimates in decision making.

Future research will focus on the application and improvement of this estimation and prediction model. Particular objectives are:

1. Extension to Finite Element Numerical Techniques,
2. Examination of historical information and publications describing the aquifer,
3. Prior estimation of aquifer parameters, boundaries, etc., with specified reliability of estimates,
4. Application of the model to the Nubian Sandstone Aquifer,
5. Optimal location of the new observation wells in the aquifer,
6. Evaluation of capabilities for predicting the effects of existing and proposed projects.

#### 4b. Modeling of Nile Inflows to Lake Nasser

Efficient utilization of the Nile waters requires the joint consideration of:

1. uncertain water supply, as provided by a complex and highly variable natural physical system which is augmented by engineering works; together with
2. growing water demand, as generated by expanding municipal, industrial and agricultural sectors.

Modern planning technology seeks to match supply and demand over the range of expected conditions, both present and future, while insuring efficiency as defined in terms of economic, social and political factors. It accomplishes this through a variety of mathematical formulations which allow the planner and engineer to explore both the economic and the physical consequences of proposed actions.

This project focuses on the uncertainties of the Nile River flows entering Lake Nasser, thus providing information for use in reservoir operation and in policy formulation. Two categories of uncertainty are considered:

1. Uncertainties in the short-term (e.g., monthly) flows to be expected at Wadi Halfa as a result of observed precipitation and streamflows in the headwaters of the White and Blue Niles. This knowledge can be used to establish a method for short-term forecasting of reservoir inflows as an aid to improved reservoir operation.
2. Uncertainty in the long-term (e.g., yearly) volumes of riverflow to be expected at Wadi Halfa as a result of possible development projects in the Sudd region of the White Nile. Here, knowledge of the interaction of climate, soil and vegetation will be used in the assessment of the expected benefits and risks of the proposed projects.

#### Streamflow Simulation and Forecasting

Planning and designing water projects in Egypt require quantification of river discharges throughout the Nile Basin. For example, plans and operation of the Toshka diversion depend on streamflows into Aswan. Similarly, the capacity of the Jonglei canal project depends on expected flows of the White Nile. Generally, historical streamflow data does not provide enough streamflow scenarios for adequate design, particularly when interest lies in extreme (floods or droughts) behavior. The above is the motivation for the development, during the past 2 years, of three different mathematical models for stochastic streamflow simulation. These are designed to reproduce the important statistical characteristics of Nile River discharges, at different points throughout the basin. The models have been successfully implemented and

used in Egypt.

In operating the High Aswan Dam, as well as other "barrages" and controls in the Nile River, it is required to predict expected future river behavior. During the past year, we have been involved in developing monthly streamflow forecasting models. These are of multivariate nature and adaptive. That means they are able to utilize incoming information on observed flows to update their parameters. Presently, forecasts up to 5 months lead time are possible with important information gains.

Future research will concentrate on the forecasting models. Particular objectives are:

1. Implementation in Egyptian computer facilities.
2. Utilization of forecasting model with optimal reservoir operations to evaluate the value of the forecast.
3. Extensive comparison of new techniques with existing procedures used by the Egyptian Ministry of Irrigation.
4. Improve forecasting of extreme events.
5. Develop relationship between geomorphologic-climatic factors and river basin behavior.

#### Water Balance Studies of the SUDD

Future increases in Egyptian and Sudanese water resources may come from reduction of the large water losses of the White Nile's SUDD\* region. In our work, new methods of water balance estimation which incorporate the dynamic interaction of climate, soil and vegetation are being applied to a study area which includes the Bahr el Ghazal Swamps and the Machar swamps. The project objective is to estimate

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\*The term 'SUDD' means the swamps of the upper White Nile.

the uncertainty in the increased annual water yield from these swamps due to proposed channelization and reclamation projects.

A conceptual model of the Bahr el Ghazal swamps and of the Machar swamps has been formulated for the purpose of studying their hydrologic behavior in response to varying annual climatic inputs.

To apply this model, we need to know different land features and vegetation distribution over the study area (550,000 square kilometers). Satellite mapping of the area was proposed and tapes of multispectral data from LANDSAT are now being processed and analyzed at the Remote Sensing Center of the Egyptian Academy of Science. This should soon produce vegetation and water surface maps of the entire study area.

A preliminary long-term average water balance of the study area has been performed, giving a mean annual water loss of 34.0 and 12.5 milliards\*\* at the Ghazal and Machar swamps, respectively. To put this in perspective, the total mean annual flow of the White Nile at Malakal is 27 milliards!

Detailed annual water balances of the sub-catchments which feed the swamps are now being performed (see Reference 1). These will be combined to yield the annual water balance of the study areas in terms of their physical characteristics, and the varying annual precipitation.

At the final stage of our work, we hope to demonstrate the effects of selected classes of drainage, channelization and agricultural projects upon the statistics of the contribution from our study area to the flow of the White Nile. This would provide the basis for estimating the future availability and reliability of additional water supplies for both Egypt and the Sudan.

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\*\* 1 milliard (md) =  $10^9$  (one thousand million) cubic meters.

#### 4c. Egyptian Water Planning Models

The project entitled "Egyptian Water Planning Models" began in January, 1978. At this time the objective of the joint team of Cairo University, Ministry of Irrigation, and M.I.T. staff was to develop "state-of-the-art" tools for aiding in planning of Egypt's water resources. The areas of most critical need to the Egyptian economy were operation of the High Aswan Dam, expansion of agricultural lands and the installation of agricultural drainage. The goal set by the team was to develop planning models based on state-of-the-art technique to aid the Egyptian government in planning for these critical areas in the future. This goal is being achieved while at the same time training the Cairo University Staff and Ministry of Irrigation personnel in modern water resource planning methods.

One of the highlights of the project has been the interaction of the C.U./M.I.T. project with the Egyptian Water Master Plan. The Water Master Plan is a group within the Ministry of Irrigation charged with developing a plan for Egyptian water resources over the next twenty-five years. The Water Master Plan has adopted a number of the tools developed during the project as official models for planning.

The next section will discuss the projects in detail.

#### Operation of High Aswan Dam

The High Aswan Dam Reservoir serves several competing purposes: water supply for irrigation, generation of electricity, flood control of downstream releases to avoid erosion in the river. Furthermore, the characterization of the whole water system is continuously changing: more water is required for irrigation because of the land reclamation programs, rapid growth of electricity demands, projects affecting the water supply are under construction (e.g., the Toshka diversion) or under study (e.g., the Jonglei Canal).

Being such an integral part of the Egyptian Water Resource system, the efficient operation of the High Aswan Dam is one of the major priorities of the Water Master Plan. The Water Master

staff together with C.U./M.I.T. have developed a state-of-the-art methodology capable of scheduling the releases in the most efficient way - on economic terms - while physical and institutional constraints are met, and flexible enough to be applied to the situations which will likely exist in the future. This methodology is a stochastic dynamic programming model. It was applied assuming the present level of demands for different uses and for situations with and without the Toshka diversion project. Finally, the performance of the system was simulated using the operating policies from the D.P. model as well as the present policies. Those results are presented and discussed in Marks, et al., (TAP Report #79-7).

This model and its results are being used by the Water Master Plan to recommend new operating policies for the High Aswan Dam Reservoir. It is planned to be continually used for updating the operation as data and objective change.

Possible topics to be addressed in the future include some extensions of the model discussed above, e.g., the joint operation of the surface and groundwater reservoirs and the introduction of real time information for discharge prediction, as well as further reaching topics like the hierarchical modeling of the system in a way such that interactions among different levels of decisions (from economic policy decisions down to the short-term allocation of water to different purposes) are taken into consideration.

#### Irrigation Water Quality and Agricultural Expansion in Egypt

The Egyptian economy is basically agricultural, as it has been for centuries. Almost half of the total population is engaged directly in this sector. Many others are engaged in processing or trading the agricultural products.

Because of the rapid increase in population with time, the area of the agricultural land per capita decreased. Therefore, the Egyptians now are planning for a horizontal agricultural expansion of approximately 2.8 million feddans. Most of these new areas are concentrated in the Delta Zone and Sinai where the available irrigation water resources are fresh water from the River Nile and drainage water. The drainage water can be used in its present state or after being mixed with fresh irrigation.

As is well known the drainage water has a relatively higher salinity. An increase in the water salinity causes an increase in the irrigation water requirements because of the leaching requirements and a decrease in crop yield. So the question to be addressed is how to get the maximum agricultural revenue when using the water supply available?

A mathematical model is built to answer the above question taking into consideration the following factors:

- a. The transmission costs from each source of water to the new lands.
- b. The degree of salinity of each source of irrigation water, transmission costs and decrease the agriculture revenue.
- c. The salt tolerance of the crops, on which the possibility of using the saline water for irrigation depends.
- d. The development costs of the new lands.
- e. The crop prices.
- f. The costs of labor, machinery, fertilizer, and seeds for the different crops.

Considering the above factors the model gives for each new area the optimum conjunctive use of available sources, and crop pattern distribution which maximize the net revenue (prices of the agricultural production less than all costs).

This model allows decision makers to analyse different alternative schemes for irrigating the new lands.

#### Agricultural Drainage Planning

Since the switch of Egyptian agriculture from basin or flood irrigation of perennial irrigation following the completion of the High Aswan Dam, agriculture has been plagued with the problems of water logging and salinity. This has required the Egyptian Government to undertake a massive program of subsurface or tile drainage. This program will require massive investments in construction of this elaborate drainage network.

The results of this project have been two-fold. First there was the development of a method to allow for the design of field

drains at the least cost. This has entailed the synthesis of physics of groundwater flow, probability theory and economics. The other result was the development of computer aided planning model for the layout of collector drain networks. These tools not only provide a more complete technique for Egyptian drainage design but also greatly improve the productivity of the Egyptian engineer which is very important in a nation with a shortage of drainage engineers. This work has been achieved with the close cooperation and enthusiasm of the Drainage Research Institute.

#### Future Plans

All three projects have completed the goals outlined for the first phase of the joint work. The future direction and expansion work is being carefully studied by all parties and a new research plan will be finalized in January.

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## SOCIOECONOMIC DEVELOPMENT

## 1. Communications

This is a study of rural communications in Egypt which is being carried out at both M.I.T. and the University of Cairo by teams which combine social scientists and engineers. This combination is necessary because the study seeks to evaluate both the social science facts as to how villagers use the communications facilities that they have, what new ones they need and desire, and the engineering design of appropriate equipment to meet those needs economically and effectively. One of the main achievements of the project to date has been to produce a close working relationship across those disciplinary lines.

In Egypt, as in many developing countries, there has been extensive study of means of communication to the rural population. Studies have been done of the audience for the mass media, and of radio in particular. Studies have been done on how to reach the villagers with the government's messages on behalf of family planning, health, and agricultural improvement. Such studies are extremely useful and more of them need to be done, but they look at only one direction of the communications flow, and the other direction also needs to be studied. Whatever the objective, communication to the villagers needs to be linked to communication from the villagers.

For example, when the purpose is public health, advice on good practices needs to be coupled with means whereby the villagers can call for help and ask questions in a crisis. A villager is much more likely to learn what he should do when he is sick and motivated to ask advice than when it is simply handed to him. Similarly, if the purpose is improvement of agricultural practice, a broadcast is useful, but a means whereby a villager can ask what he should do about a blight is even more useful. Thus upstream communications need to be looked at just as much as downstream ones.

So the purpose of our project is:

1. To catalogue what technologies of communication are

now available that are appropriate to village use in reaching out to outsiders.

2. To determine what means of communication are now available to villagers.
3. To consider technological alternatives and improvements that would be appropriate to the needs of Egyptian villagers today.
4. To study how villagers use the facilities that are there, who uses them and under what circumstances.
5. To assess how much gain in productivity and welfare follow from the introduction of new communications facilities into villages.

Particular attention is being paid to telephones, but also to all means of communication including the mails, telegraph, travel to town, use of organized associations, etc.

The first year's work on the social science side consisted of studying 9 villages. These were chosen from 80 or so villages in Egypt which have been the subject of community studies. We picked the 9 to be fairly diverse, and to be ones for which we could employ the original researcher who had already studied it to go back to look at its communications patterns. These village reports are now completed and a synthetic report is being prepared in English.

The plan for the second year is to do a national survey of villages based on what we found in the first nine.

The first years work on the engineering side was to design a switch and "telex" appropriate to village use. The switch is a solid state device predicated upon the fact that in most villages there is little if any capacity in the switch for added lines, but very little traffic on the existing switch. It therefore makes sense to add "extensions" to the existing lines, and in that way reach the unserved hamlets. However, to obtain the consent of the existing line subscribers, the attachment device gives priority to the calls of the present subscriber.

The device that we call a village telex is actually a coupler of a telephone to a TV set, and a memory in which messages sent over the phone are stored. When desired these stored messages are displayed on the TV set by a character generator.

Both these devices are very cheap and also rugged for easy maintenance.

## 2. Labor Migration

### Scope and Purpose

The migration of Egyptian Workers to other Arab countries is a phenomenon of considerable importance for the country's economy and for the region as a whole. The purpose of this project is to determine the type, extent, and nature of this migration, the composition of migration workers, and its effects on the Egyptian economy and society. In the absence of comprehensive statistics on the migration of Egyptians, it has been necessary to devote time to the development of estimates of both composition and trends.

Three types of investigations were undertaken as the basis of the research design for the project as a whole: (1) descriptive analysis of migration data; (2) policy analysis of the governmental approaches to migration and of potential responses to trends and composition; and (3) statistical and/or simulation analysis of the effects of migration on specific sectors of the economy.

The main objective of this project, therefore, is to obtain a comprehensive view of the nature and effects of migration on the country's economic, social and political characteristics. Since manpower is one of the country's most important resources, and since Egypt has traditionally provided labor to many other Arab countries, determining the composition and effects of this migration is an issue of major importance for the country's development and for its relationships with other Arab countries.

### Accomplishments to Date

1. Analysis of the migration of construction workers; estimates of stock, flows, composition, countries of destination, and inferences regarding effects of the economy as a whole.
2. Analysis of the effects of the migration of construction workers through a simulation analysis of the implications of alternative sizes of the construction labor force on

different sectors of the economy.

3. Compilation of comprehensive data on the internal characteristics of the educational system in Egypt, including student enrollment by level of education, subject, type of school, teachers, and governorate, over a ten-year period.
4. Compilation of comprehensive data on the migration of Egyptian teachers to other countries, both Arab and non-Arab, in terms of missions and secondment over a ten-year period.
5. Descriptive and stastical analysis of the trends in the migration of university staff in six major Egyptian universities, taking into account departmental and faculty affiliations to determine the effects of the staffing of universities.
6. Compiling comprehensive data on the migration of health personnel to other Arab countries, since the medical profession in the Arab countries is heavily staffed by Egyptians.
7. Developing estimates of the overall pattern of Egyptian labor migration in the Middle East.
8. Undertaking a survey of the structure and approach to manpower planning for development which would provide some important directives for subsequent inquiry into manpower planning for Egypt.
9. Analysis of policies toward the migration of labor over the past fifteen years, including a review of the major policy positions, the government's formal stances, and changes over time.

#### Plans for the Future

Any comprehensive analysis of labor migration must move in the direction of manpower planning. Since there are costs and benefits to this migration, it is important to develop a broad approach to manpower planning which takes into account the gains from the employment of Egyptians in other countries, as well as the losses to the economy and society of this migration. So, too, it is anticipated that the extent and composition of this migration might change over time; thus, planning for the return of the migrants might, increasingly, become an important policy issue.

### 3. Health Care Delivery Systems

This project focuses on aspects of health care delivery in Egypt relevant to the problem of malnutrition among preschool-age children. The project's principal objectives have been to assist the Ministry of Health in its expanding efforts to both understand and address the malnutrition-mortality-fertility dynamic commonly found in Egyptian society and, in so doing, to help narrow the gap between promise and performance which is characteristic of the rural health service, in particular.

In pursuit of these objectives, the project initiated two types of inquiry in 1977, the data for which have been collected, converted into machine-readable form, and analyzed (in part) to date.

One line of inquiry entails computer-based analysis of governorate data concerning infant mortality, the birth rate, various demographic and developmental indices, and characteristics of the health system. This work seeks to illuminate the interaction between mortality and fertility in Egypt and to specify the effects that different modes of development have on each. Also being probed are the independent impact of health interventions on infant births and deaths, the circumstances conditioning popular utilization of health services, and problems of "reporting bias" in the data. This research is intended to locate the malnutrition-mortality-fertility dynamic in its socio-economic context and then to illuminate the critical linkages and causal patterns involved.

The second line of inquiry pertains to development of a questionnaire and its distribution to a national sample of 132 rural health centers (one per district). The questionnaire, which was administered by the Ministry of Health in March-April 1978, solicits three types of information as follows: Part I: perceptions, beliefs, attitudes, and reported behaviors on a range of issues, with the head doctor of each facility being the principal respondent; Part II: retabulation of data routinely compiled at the center/unit level but employing new categories, disaggregations, and combinations in order (hopefully) to make these data more informative and serviceable; and Part III: original data on nutritional status generated by a two-week exercise of weighing more than 4,000

children in a subsample of health centers (one per governorate). Part I is an ambitious attempt to define what really happens at the periphery of the health system, where contact with the public takes place. Part II is designed to test the utility of existing data collected at the periphery for problem identification, program planning, and monitoring. Part III has two purposes: to test the feasibility of making nutritional surveillance an on-going activity of the rural health service, and to generate new growth data for comparison with the perceptions and existing records already secured in Parts I and II. The questionnaire in its entirety constitutes the principal concern of the project and should also be its principal contribution.

The project has produced a number of working papers to date, along with one published article in an Egyptian journal.<sup>1</sup> A reference manual containing statistical distributions from all three parts of the questionnaire is nearing completion, as is a detailed analysis of the governorate data. Several studies based on the questionnaire are projected for the remainder of the current fiscal year. In addition, the project has provided training to Ministry personnel in connection with the weighing exercise, and in July 1978 Dr. Field made a formal presentation on malnutrition and health care at a Ministry symposium for district and governorate health officials. One spin-off benefit to Cairo University as a result of the project is the experience acquired with questionnaire design, pretesting, coding of data, and computer analysis.

While useful results have been obtained and are in prospect, there are questions among the M.I.T. investigators with respect to the future of the project. These questions arise because of differences in the working and research styles and interests of the M.I.T. and Cairo University project members. Therefore, the present goal is limited to completing the tasks which have already been started.

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<sup>1</sup> John Osgood Field and George Ropes, "Development in the Egyptian Governorates: A Modified Physical Quality of Life Index," L'Egypte Contemporaine (May 1979).

#### 4. Improved Methods of Macroeconomic and Sectoral Planning

The objective of the project is the development of improved methods of macroeconomic and sectoral planning in Egypt. In its first stages the project has concentrated on the formulation of multisectoral models of the Egyptian economy, the collection and estimation of data and preparation of computer programs for the solution of the models and, finally, actual implementation to study economic policy problems. The first set of models which have been developed in this manner are the General Equilibrium Models, GEM-1, GEM-2, and GEM-3. These are multisector, static models which reflect the general interdependence in the economy, while achieving solutions which indicate the implications of exogenously specified government expenditure, investment and export targets.

The GEM-1 model determines prices, outputs and incomes which are consistent with the exogenous final demand specifications as well as the level and composition of consumer demands, the distribution of income and government revenues and expenditures, including in the latter the levels and distribution of subsidies. The GEM-2 model adds the calculation of demands for primary inputs and the GEM-3 model achieves consistency between the demands and availabilities of primary factors, the latter determined by the constraints placed upon factor supply. Thus, the GEM models are a comprehensive set of tools for investigating the immediate implications of a particular set of output targets or government tax and subsidy policies of changes in factor availabilities.

In order to implement the GEM models it was necessary to undertake the estimation of a comprehensive set of data not otherwise available in Egypt. An input-output table was updated and made consistent with the national income accounts; the distribution of government expenditure by sectors was estimated as was the distribution of exports and investment by delivering sector. The size distribution of income by urban and rural households was estimated not only in total but by producing sectors. These estimates were used with estimates of consumption elasticities to calculate the distribution of consumer expenditures. The distribution of taxes and subsidies was also estimated. All these estimates

were combined in a Social Accounting Matrix (SAM) which is the accounting backbone of the GEM models. Computer programs were prepared and tested and then used in the solution of the GEM models with the Cairo and M.I.T. teams interacting intensively in the process. The models are being continuously updated.

The GEM models have been applied to the investigation of a number of policy issues and the input-output table and the SAM were used in the Ministry of Planning in the formulation of the plan prepared in November, 1978.

The next research step has been the construction of multi-sector, intertemporal optimizing models which would permit the more intensive investigation of the longer term consequences of alternative investment, manpower, tax and expenditure policies. These preparations include the formulation of the new models, the estimation of an updated input-output table, and of capital coefficients and investment deliveries matrices and import coefficients. Computer programs have been tested and first solutions calculated of a simple version of the model.

It is anticipated that future research will focus to a greater extent on sectoral issues both for their own interest and as a means of improving the models. In addition some attention will be given to the feasibility of research on monetary and financial features of the Egyptian economy.

## CHAPTER 2. IMPACT OF PROJECTS ON PROGRAM GOALS & OBJECTIVES

The program has undergone two evaluations prior to the current one. The first of these was conducted and reported to AID in July 1977. The second evaluation took place in April 1978. At this point in time projects had experienced a full year of operating in the program and sufficient information was available to provide insights into the effectiveness, impact, and feasibility of attaining the goals and objectives of the program. The evaluation process used was by questionnaire to all M.I.T. faculty participants. The faculty members provided their impressions of the program in the following specific areas.

- I Academic Contributions to M.I.T.
- II Contributions to Egypt
  - A. At Cairo University
  - B. Government Ministries
- III Project and Program Administration
  - A. The Research Context
  - B. Administrative Context
  - C. Concerning Students at M.I.T.
  - D. Concerning Students at Cairo University
- IV Overall Evaluation of Program Structure

The results of the faculty response to the questionnaire are provided in Appendix 4. The results were reviewed and discussed at a one-day review meeting at M.I.T.

In conducting the present evaluation it was felt that a different series of questions were desirable in determining the effectiveness of the projects over the two and one half years of the program. These questions are provided in the Evaluation Plan, Appendix 2. Interviews were conducted with the project participants and the results of the interviews are provided in the following section.

MOBILIZATION OF ACADEMIC INTEREST

## ENERGY

- The Long Term Investment Planning of the Egyptian Electric Power System Project has demonstrated the importance of an economical approach towards engineering problems. This is a concept which was new to many participants who were deeply rooted in classical engineering analysis.
- A short course on Reliability Evaluation was conducted at Cairo University. This course helped Junior Cairo University staff and Engineers from the Egyptian Electricity Authority to understand the concept of reliability and its effect on the policy of the Electric power utilities. The course has been printed and made available for interested engineers.
- A course on System Planning is being prepared in cooperation with the Egyptian Institute of Electrical Engineers as part of their program of Continued Engineering Education.
- Topics dealing with System Planning for the Egyptian Grid in urban and rural areas have been introduced as Bachelor of Science projects at Cairo University.
- Topics in Reliability Evaluation and Urban and Rural System Planning have been selected as M. Sc. and PhD research points. Six Engineers are presently working in these research areas. Two have completed their theses.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The project has resulted in close cooperation between the University staff and the Ministry of Electricity. Staff members from the Ministry visit Cairo University on a regular basis and lecture B.Sc. students on the Egyptian unified power grid and related planning and operational problems.
- Economical analysis and cost-benefit comparison studies conducted by the project have lead the Rural Electrification Authority to reconsider its present design practice for low voltage distribution networks in the newly electrified rural areas. The work, which introduced the application at advanced statistical techniques will result in setting up new planning parameters for rural electrification which will form a solid basis for policy decisions.
- The project has assisted the Egyptian Electricity Authority in the evaluation of the advisability of different methodologies of the urban subtransmission networks to point out the most reliable methods and schemes of operations to maintain continuity of supply to consumers
- Analytical models which have been prepared are being used by the Egyptian Electricity Authority to evaluate the reliability of of generation and transmission systems to attain the optimum level of system reliability. These computer packages have been applied to the generating stations in Lower Egypt and to the 22 OKV transmission network.

MOBILIZATION OF ACADEMIC INTERESTENERGY  
(cont'd.)

- Analytical models are being used, data updated, and systems modified by Cairo University staff.
- The Cairo University Staff has made significant progress both in terms of managing the Electrical Power System Project and in improving their own technical capabilities.
- Strong ties with the Ministry of Electricity have been established and new study areas have evolved from this relationship. Proposals are being considered which may expand the participation of the study areas to include a cooperative effort with the Water Resources projects effort on the optimal use of the High Dam.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The Ministry has prepared a guide for the most economical maintenance scheduling of generating units which minimizes the generating cost.
- The Ministry has requested the project team to evaluate a World Bank study thus demonstrating its confidence in the team's capability.

MOBILIZATION OF ACADEMIC INTERESTMANU-  
FACTURING

## (PLASTICS)

- The objective of the Plastics project is to strengthen the area of Engineering Plastics Technology, which is of obvious relevance to economic development in Egypt. M.I.T. and Cairo University participants have collaborated closely with a number of public sector and Government establishments in the solution of a variety of problems. Competence in the field of Engineering Plastics has progressively developed at Cairo University through involvement in industrial R & D, the development of laboratory facilities, the acquisition of a Plastics Library and visits to M.I.T. and industrial units in the United States.
  - Studies are undertaken by forming a group of 2 or 3 members who collaborate on the fulfillment of a given task. This may be either initiated by the project because it is believed to be of relevance to the scientific infrastructure of plastics technology or requested by industry. Detailed reports are prepared and presented to the interested establishments.
  - Both new studies and expansions of those initially started have taken place by the own nature of the project. Initial emphasis was on two major products, i.e. PVC pipe for water distribution and P.E. film for fertilizer bags.
- The results of the studies undertaken by the project are generally applied in a constructive manner because they are in most of the cases requested by the Ministry of industrial organization involved. Organizations for which studies have been prepared on request include the Petrochemicals Project, the Egyptian Public Authority for Drainage Projects, El-Nasr Pharmaceutical Chemicals Company and the Pharmaceutical Packages Company.
  - The results of the project studies are usually specific to the needs of the organization interacting with the project.
  - The selected studies are of immediate relevance to the strengthening of plastics technology. They cover the areas of standard applications for raw materials and end products, testing and quality, training and Industrial R & D promoting design with plastics.
  - The project role has been to demonstrate the feasibility of adopting rational methods of solution for tackling the problems in question. The EPADP is planning to continue relying on the project technical assistance not only for raw materials and pipe testing but also for technical advice related to production problems, evaluation of bids, etc.
  - The objective of promoting Engineering Plastics has been clear to Egyptian planners

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

MOBILIZATION OF ACADEMIC INTERESTORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

MANU-  
FACTURING  
(cont'd.)

The product activities have expanded to include corrugated PVC drainage pipes, collapsible blood and IV solution containers.

all the time. The role of the project has been to strengthen the area of plastics technology both at Cairo University and in Industry.

(PLASTICS  
cont'd.)

- The skills and expertise which have been developed in the Plastics project are noteworthy. These skills have been developed through project efforts including a five-day workshop on Polymer Science & Technology, the acquisition of testing equipment, and development of quality control procedures.
- Undergraduate B.Sc. projects and graduate research programs in the field of plastics engineering have been initiated and are being expanded at Cairo University.

- Engineering Applications of Plastics is still a new field in Egypt; there is no set government program for its promotion up till now. The CU/M.I.T. project has demonstrated the importance of a sound scientific infrastructure and several governmental authorities are starting to depend on the group for consultation.

(SMALL  
SCALE  
INDUSTRY)

- \* Project in Small Scale Industries did not generate sufficient academic interest to warrant an extension of the project beyond July 1978.

- Application of study results in Small Scale Industries projects difficult to determine since study was not renewed beyond July 1978.

MOBILIZATION OF ACADEMIC INTEREST

- PUBLIC WORKS  
(Housing)
- One of the main achievements of the CU/M.I.T. joint research of the Housing Project was the opportunity given to teaching assistants in the Departments of Architecture and Structural Engineering to participate in different phases of the on-going research by collecting data, conducting field surveys, applying outlined analysis techniques, drawing plans and graphs, and undertaking laboratory experimental research.
  - Graduate students who participated in the Prefabrications Systems sub-project as research assistants, studying and applying a new design methodology suitable for industrialized techniques, were chosen and appointed in a later stage by consulting offices to help in the design of actual projects for Sadat City using the same design methodology. Such a situation helped in introducing and disseminating the research results.
  - Follow-on studies are planned and designed at the level of specific research tasks for graduate students to obtain their M.A. and M.Sc. A graduate student in the Structural Engineering Department, CU, for example, has already been granted the M.Sc. on "Development of Housing Masonry Blocks from Egyptian Gypsum" which served as a part of the Materials subproject. Prof. Albert Dietz of M.I.T. was one of the thesis reviewers. Three

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The Housing Economy subgroup has planned and succeeded in having regular meetings with the top ministry personnel to pick up relevant and persisting development problems.
- Collaboration with the Ministry of Housing and Ministry of Development and New Communities was established, resulting in a joint seminar with Cairo University held in January 1979 on Core House and Sites and Services for Low-Income Groups.
- Research results of Housing Project as presented by the Housing Economy subgroup have definitely affected some current policy decisions taken by the Ministry of Housing, e.g.:
  - . The establishment of Housing Bank
  - . The use of graduated mortgage system
  - . The abolition of cement subsidy
  - . The ministry attention drawn to the necessity and need for developing coherent urban policies, which urged the Ministry of Development and New Communities to ask the USAID for financing Urban Policies studies that will be shortly underway.
- Good contacts were also made between the Housing research team and GOPP personnel and collaboration was achieved on many occasions, e.g., working on utility in-

MOBILIZATION OF ACADEMIC INTEREST

## PUBLIC WORKS

(Housing  
cont'd.)

- other graduate students of the Department of Architecture, CU, working with the project on housing technical coefficients and users participation in housing were already admitted to M.I.T. for postgraduate studies starting September 1979. A number of graduate students, as well, are working in CU on their M.A. and M.Sc. on topics directly related to the Housing project, among which are the new technique of surface-bonded masonry walls, the technical coefficients for the infrastructure of housing areas, and the evaluation of some newly introduced housing building systems.
- The Economic Policy subproject developed a system of data comprising a set of technical coefficients for housing which would be of use for the construction industry and of help in future research.
  - Studies originally undertaken by the Prefabrication Systems subproject to serve the prefabrication factories were further developed, filtered and applied in Amriya and Sadat City Projects, and were also of help for the design of projects adopting different industrialized techniques of construction such as the "Tunnel Forms".

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

infrastructure, and setting a workshop at M.I.T. for GOPP personnel for two weeks in 1978 to establish better understanding and initiate interest in research. In addition, a study within the Housing project will be undertaken with GOPP, which could influence the government policy with regard to the informal sector whose development around Cairo has not yet been clearly defined where estimates vary from 20 to 70% of the total housing construction in the last 15 years.

- The research activities of the Housing Project not only initiated interest and achieved collaboration with concerned ministries, but also succeeded in attracting the attention of the government top levels. This was crowned by a meeting of two core members of the Housing with Dr. Mostafa Khalil, Prime Minister and Eng. Soliman Metwally, Minister of State for Cabinet Affairs and Local Government.
- Prime Minister, Dr. Mostafa Khalil, in the presence of President Sadat during his meetings with the Universities staff members starting September 30, 1979, gave mention to the CU/M.I.T. Housing Project and indicated explicitly that the outcome of the on-going research project was fed into the "Housing National Committee" assembled last March to put a nation-wide policy for solving the Egyptian housing problem.

MOBILIZATION OF ACADEMIC INTEREST

- PUBLIC WORKS ● Initiating academic interest in research was extended to junior faculty members, where three of them recently joined the research team after showing deep interest in on-going research and presenting new analytical techniques as an expansion of the current research activities. The presented new topics included economy of regional planning, environmental control and design criteria of layout, and a methodology of design evaluation by equal cost solutions.
- (Housing cont'd.) ● A new and valuable line of research was initiated in 1978 on construction management and productivity techniques in housing construction. This is now expanded, modified and is being undertaken by a new group of research personnel as a separate subproject.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The new design methodology presented by the Prefabrication Systems subproject was mainly attractive to consultant engineers involved in the new projects such as in Sadat City, specially when dealing with industrialized techniques of construction. Consultant engineers, rather than people of the Ministry of Housing, seemed to be those who would benefit most from the research results; since the ministry does not have a direct authority on the prefabrication factories to which the study was mainly directed.
- Although contacted governorates were deeply interested in the developed proposals for low-income housing, the implementation of such proposals fell short due to lack of necessary funds.

MOBILIZATION OF ACADEMIC INTEREST**PUBLIC  
WORKS**(Trans-  
portation)

- The research of the TPP Program has attracted all of the Cairo University faculty members with a transportation background.
- Full documentation of traffic patterns of all modes for the greater Cairo area are available on tape and computer print-outs. This data, the only such in existence is available to any government agency. It is being used and continually updated.
- Cairo University Faculty members, together with members of the Transport Planning Authority have been awarded a separate contract from AID to expand upon the work completed in the CU/M.I.T. project.
- Based upon the successful completion and implementation of the maintenance model of the CU team, in conjunction with the M.I.T. team expanded the area of study to undertake research in multi-modal study of the transportation system.
- The Cairo University teams working on the two transportation projects have coordinated the efforts of both projects to insure a minimum of overlap and concentrating on the new directions needed in the planning efforts.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The Ministry of Transportation and the Governorates of Cairo and Giza are using the transportation data base for evaluating transport planning for investment proposals.
- The Ministries used the data base to test the economic results of elevated road construction.
- The Ministry used the economic evaluation output of the data base in negotiations with the World Bank for short term investment projects in Cairo. The decision on this project will be made in November 1979.
- In June of 1978 a World Bank mission explored the possibility of financing intercity road maintenance. The economic justification was provided by the Cairo University/M.I.T. study. The World Bank is going to supply \$30MM to the Ministry to support the work. The World Bank noted "much of the traffic and public transport data will be available from the M.I.T./Cairo University team. The quality of these data is very high and provides a unique opportunity for project planning and evaluation."
- Upon completion of the Road Transport analysis phase of the project Engineer A.F. El-Daghestany, the Minister of Transport, Communications, and Maritime Transport wrote:

MOBILIZATION OF ACADEMIC INTERESTPUBLIC  
WORKS

(Trans-  
portation,  
cont'd.)

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- "The cooperative efforts of the M.I.T./Cairo University, Transport Planning Authority (TPA) and relevant authorities in the Arab Republic of Egypt have efficaciously contributed to the successful completion of this Phase. This study has succeeded in the adaptation of technology to the analyses and evaluation of highway investment decisions in Egypt. The study will be of great use for the development of highway maintenance. I am looking forward for further constructive efforts and fruitful cooperation for the solution of other transportation and traffic problems encountered in Egypt."
- The Transport Planning Authority has made specific requests to the M.I.T./Cairo University team for further studies which include the provisions for a training program for TPA personnel.
- The multi-modal model being prepared now will provide a unique tool to the Ministry of Transportation in an ongoing study of National Transportation in which difficult policy parameters, effecting taxation, investment policies for the different modes will be analyzed.
- The Cairo Transport Authority has utilized the project work to implement direct bus routes, express service for buses, bus monitoring systems, data gathering for bus usage, and allocation of buses to routes.

MOBILIZATION OF ACADEMIC INTEREST**PUBLIC  
WORKS****(Water  
Resources)**

- In the spring of 1978 a workshop was held at Cairo University for practicing Engineers and University personnel. The details of this workshop are provided in the section on conferences, seminars, and workshops (Part 3, Chapter 1). The impact of this workshop and the cooperative work undertaken during the life of the three Water Resource projects was demonstrated by the large number of outstanding technical papers presented at the Conference on Water Resources Planning in Egypt on 25-27 June 1979.
- The Cairo University team has been instrumental in the coordination efforts of the project work with the five-year Egyptian Water Plan, the UNDP, and other University research being conducted in Egypt. Weekly working meetings are held.
- A new spirit of cooperation between Cairo University and the Ministry of Irrigation has developed as a result of the projects. Two faculty members from Cairo University have been appointed to the Board of Directors of the Water Resource Institute.
- Staff members at Cairo University have built up a water resources team which feels it is professionally current in technological areas.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- Ministry of Irrigation personnel are deeply involved with all three water resource projects. The involvement is at all levels within the ministry.
- The studies have raised questions regarding the optimum use of the High Dam for irrigation vs. electric power generation.
- The Ministry of Irrigation has requested new areas of research as follows:
  - (a) The planning and design of drainage networks, and the quality of the drainage water for irrigation.
  - (b) The Toshka canal design and its impact upon the operation of the High Aswan Dam.
- A dynamic programming model for the optimal operation of the High Dam has been developed and production runs have been made. The project group trained the Egyptian Water Master Plan Engineers in the use and objectives of the model. The Egyptian Water Plan Engineers have been using the model and updating it as required to compare different policies for Dam operation.
- A growing interest and cooperation with the Sudanese has developed, and a suggested study of the White Nile has been undertaken.

MOBILIZATION OF ACADEMIC INTERESTSOCIO-  
ECONOMIC  
DEVELOPMENT(Communica-  
tions Needs  
for Rural  
Develop-  
ment)

- In the Communications Needs for Rural Development Project an inter-disciplinary team from Cairo University was formed. These include Communications Engineers, Social Science faculty and members from the Faculty of Mass Communications. This is the first time this type of Cooperation has been achieved across the lines between social science and engineering.
- A number of assistants and graduate students are working in the project, some registered their degrees in subjects related to the project (one Ph.D in political science and three MSc in engineering).
- Data collected from nine villages are stored in Cairo University computer for future use and are available for any government agency.
- Though originally not planned the research led to two new areas of interest: The use of small technology in communication for developmental purposes and the cost-benefit analysis of investment in telecommunication (particularly the telephone) in rural areas.
- The project is at the stage of having direct governmental participation in the conduct of the national survey.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- Although no direct ministry participation has been achieved in this recently established program contacts with the Ministries were established. Preliminary discussion with the Ministry of Health and with the Family Planning Program have also been held. It is intended that these organizations will become involved in the project at a later date.
- Experiments on a village telephone and a telex-telegraph which are being developed at Cairo University engineering laboratories are being done in cooperation with the Telecommunication Research Centre of ARETO and are partially financed by it.

MOBILIZATION OF ACADEMIC INTERESTSOCIO-  
ECONOMIC  
DEVELOPMENT

(Communica-  
tions Needs  
for Rural  
Develop-  
ment)

- (The research suffered slightly due to the abolishment of the Ministry of Local Government which could have been an ideal place to cooperate with at this stage and with whose personnel initial contact was made.)

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

MOBILIZATION OF ACADEMIC INTERESTSOCIO-  
ECONOMIC  
DEVELOPMENT(Labor  
Migration)

- At the inception of this project one Professor from the Department of Economics at Cairo University was involved. Participation has now been extended to three Departments (Statistics, Political Science, and Economics) and four faculty members. The number of graduate students and research assistants has also increased markedly. The conduct of interdisciplinary research at Cairo University as demonstrated in this project is a significant attainment.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The Labor Migration project is of concern to several individual Ministries and organizations. These include the Ministry of Education, the Ministry of Health, the Population and Family Planning Board, the Ministry of Planning, the Ministry of Labor and the Central Agency for Mobilization and Statistics. The project's cooperative efforts have initially been to organize the Ministries' information and computerizing it, and then undertaking analysis of the data.

MOBILIZATION OF ACADEMIC INTERESTSOCIO-  
ECONOMIC  
DEVELOPMENT

(Health Care)

- The initial phase of the Health Care Delivery project was jointly planned by the Cairo University/M.I.T. team members. The analysis of data obtained from the national sample of 132 Health Centers entailed a division of labor in which some aspects were developed at Cairo and others at M.I.T.
- Cairo University personnel have assumed major responsibility in the conduct of future research. The proposal for FY-80 was prepared by the Cairo University team on the strength of its own collective sense of what it feels is needed in the future.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The "Health System Questionnaire" was designed in response to the desires of the Ministry of Health. The data generated reflect the Ministry's conception of need and opportunity. The effort was entirely executed by the Ministry, including dissemination and retrieval, supervision and completion of forms.
- Ministry personnel played an important role in the coding process.
- Ministry personnel have had direct input to the direction of future research efforts for FY-80.

MOBILIZATION OF ACADEMIC INTERESTSOCIO-  
ECONOMIC  
DEVELOPMENT(Macro-  
Economic  
Planning)

- The project on Improved Methods for Macroeconomic and Sectoral Planning has been from its inception one in which the Cairo University and M.I.T. members have interacted intensively. General research plans have been worked out jointly as well as the specific responsibilities of the Cairo University, M.I.T. and Ministry of Planning personnel. The results have been jointly reviewed. The Cairo University team has taken the responsibility for applying the General Equilibrium Models (GEM) which have been developed to a number of different policy issues. The exclusive responsibility for improving existing data and developing the data necessary for new models has rested with the Cairo University and Ministry personnel.
- The project involves at least 6 programmers from the Institute of Statistics Computer Unit. They have been trained in the use of sophisticated models which had not been used before.

ORGANIZATION OF TECHNICAL RESEARCH  
IN COLLABORATION WITH GOE MINISTRIES

- The Minister of Planning has taken an active interest in this project and has requested that reports be made directly to him on the methodologies and findings of the project.
- The Minister of Planning used the Social Accounting Matrix estimated in the project in formulating his recommendations for tax and subsidy policy in Egypt. The Minister has also asked for the use of the model in special studies of the impact of changes in various subsidy programs.
- Prime Minister Khalil has requested the cooperation of the project in studying a number of different topics including the government consumer subsidy program and the implications of changes in the tax structure. He also expressed an interest in having the project extend its sectoral studies to a detailed investigation of the public enterprise sector.
- The Ministry of Planning used the input-output table in the Macro Equilibrium Model to arrive at the balance of the 1979 plan. The Ministry is now using the new input-output table at 32 sectors to estimate and project output levels in the next five year plan.

## Conclusions

The specific accomplishments of the individual projects have addressed immediate needs of the Government of Egypt. The technical aspects of the projects have produced positive and noteworthy results and are influencing other ongoing development programs in Egypt. The projects have had a positive impact on the academic communities as well as the ministry personnel that have been involved. A bridge between the University and the ministries has started to develop and positive benefits are becoming evident.

## PART 3

## EDUCATIONAL ACTIVITIES

The educational aspects of this program perform an integral part of the entire progress of technology transfer. Benefits to all participants - Cairo University faculty and students, Ministry personnel, M.I.T. faculty and students - are enhanced through a diverse array of educational activities, all of which are carried out in the context of the individual projects. In this part of the report three specific approaches will be described and their impact upon program objectives evaluated.

CHAPTER 1. WORKSHOPS, CONFERENCES AND SEMINARS

Within the context of this program the following definition of terms applies:

- Conference - A major meeting on a fairly broad subject area attended by M.I.T./Cairo University personnel, and ministry personnel. Conferences are co-sponsored by the ministry which has the major interest in the subject area.
- Seminars - A meeting on a specific subject area attended by those Cairo University/M.I.T. personnel and ministry participants who are actually performing work on the project.
- Workshop - A short term course of instruction focused on an area of knowledge which needs upgrading in order to accomplish project requirements.

It has been the intention of the program to hold a major conference in Cairo each year. By so doing all participants M.I.T./Cairo University/ministry have the opportunity to present the results of their research efforts to their peers and to those personnel working in the field, primarily the ministries, who may not be aware of the state-of-the-art of the research being conducted in Cairo.

The first major conference was held in Cairo 21-24 January 1978

on "Development of New Approaches to Housing Policy and Production in Egypt". The conference was co-sponsored by the Ministry of Housing and Reconstruction. The Chairman of the General Organization for Physical Planning also provided support and had a personal interest in the conference. Personnel from the Ministry of Planning also participated in the conference.

During the conference a total of fifteen papers were presented and discussed and have been published in the Technology Adaptation Program Report series. The conference was an extremely beneficial experience for the participants since it provided direct interaction on the significant issues of the project. The active participation in discussions following papers provided a focus for continued work and was partially responsible for introducing new initiatives into the projects.

The second major conference was held in Cairo from 20-22 June 1978. The subject of this conference was Transportation Planning Policy and was co-sponsored by the Transport Planning Authority. In the three days of the conference papers were presented by members of Ministry, the Cairo University faculty and M.I.T. faculty. The areas covered were National Transport Policy, Transport Systems Analysis, Transport Modes, and Urban Transportation. The conference provided an opportunity for cross-fertilization of the two transportation projects in an environment of open discussion with Ministry planners. The results of the conference contributed not only to the overall understanding of the transportation problems, and the work underway towards their solution but also to the direction of future research.

The third major conference held by the program was a conference on Water Resources Planning in Egypt. This conference was co-sponsored by the Ministry of Irrigation and held in Cairo 25-27 June 1979. The sessions of the conference covered the following areas:

1. Egyptian Water Master Plan
2. Surface Hydrologic Studies
3. Groundwater Hydrologic Studies
4. Irrigation and Drainage Studies
5. Water Quality and River Degradation Studies.

Participation in the conference was wide. Representatives from three Egyptian Universities, five U.S. Universities, one Italian, one British as well as the Ministry of Irrigation contributed to the conference. The purpose of the conference was to present ongoing research findings associated with water planning in Egypt. The conference also provided a forum to demonstrate the technical contributions developed by the Cairo University/M.I.T. groups, and show how this capability is being applied to understanding and resolution of real problems. The conference also established a mechanism for obtaining early discussion and communication of important technical findings and policy directions growing out of planning efforts with the Egyptian Water Resources community.

Workshops have provided another opportunity to enhance the educational needs of the various participants. Workshops have been organized and carried out when a specific need has become apparent. In conducting workshops the intent has been to involve practicing engineers and participants from the Ministries and from Cairo University. The workshops conducted are described as follows:

7-13 January 1978 - This five day workshop in Polymer Science and Technology was presented at Cairo University. Approximately fifty persons attended, including faculty, staff, and graduate students from Cairo University as well as representatives from government and industry.

May - June 1978 - A four week workshop in "Elements of Water Resource Systems: Analysis and Planning" was presented at Cairo University. The intent of the workshop was to present an overview of the fundamentals and current state of the art water resources systems analysis and planning concepts which are most applicable to the Egyptian Water Master Plan. Lectures in fundamental areas were given to set the stage for application lectures on physical modelling of surface and groundwater hydrology, the role of uncertainty in water planning, evaluation methods to help resolve multi-objective, multi-interest group conflict problems concerning allocation of water resources. Particular emphasis was given to the tools being developed by the project team in support of analysis problems generated by the Egyptian Water Master Plan.

December 1978 - January 1979 - A workshop on Reliability of Power Systems was presented at Cairo University by the faculty participants in the Long-Term Investment Planning for the Egyptian Power System project. The course was designed

to familiarize personnel, both at Cairo University and the Ministry of Electricity with the principles of reliability evaluation, the methods commonly used and the particular problems which the Egyptian National System presents.

In addition to the conferences and workshops a number of seminars have been held during the course of the program. A listing of seminars held is as follows:

7 June 1978 - A one day seminar on Small Scale Industrial Development at Cairo University.

March 1978 - "Water Development Issues in Egypt," by Prof. I. Assiouti at M.I.T.

March 1978 - "Use of Computer Models in Reservoir Operation," by Prof. D. P. Loucks at Cairo University.

January 1978 - "Techniques to be Used in Water Balance Determination for the Bahr El Ghazal Region," by Prof. P. Eagleson at Cairo University.

January 1978 - "Streamflow Forecasting Techniques and Their Application in the Nile System," by Prof. R. Bras at Cairo University.

December 1977 - Core Housing Seminar at Cairo University. Participation was limited to those experts with direct involvement in the issues. Ministry personnel, architects, planners and engineers actively involved in the design and implementation of projects participated.

## Conclusions

The conferences, workshops and seminars which were conducted have upgraded the technical capabilities of the faculty participants and the ministry personnel. Their concentration on areas of interest to the specific projects has broadened the scope of the projects and has contributed greatly to the increased participation by the Egyptian project teams.

## CHAPTER 2. VISITING FELLOWS PROGRAM

In the program to date over 50 Egyptian counterpart personnel from Cairo University and various government agencies have visited M.I.T. In addition to working directly with their counterparts on project research, some have received specific training in relevant planning methodologies and analytic techniques through the Visiting Fellows Program or as M.I.T. students. At M.I.T., an Egyptian scholar participates in one of four different categories of study:

### (1) Visiting Fellows Program

- (a) Center for Advanced Engineering Studies (CAES)  
Students in this category pursue a general course of study corresponding to semesters at M.I.T., with specific project-related content. The program provides tuition payment plus subsistence.
- (b) Other  
A study program of short duration is individually designed which applies to a specific aspect of an approved project. Approval of the participant's status is granted by the Principal Investigator of the project and funds are provided by that project.

### (2) M.I.T. Students

- (a) Regular Graduate Students  
Regular Graduate Students are admitted to M.I.T. in degree-granting programs. Following admission by M.I.T., the Executive Committee reviews the student's background and may offer the student a Research Assistant position applied to a specific project. The student receives the regular M.I.T. Research Assistant stipend amount.
- (b) Special Graduate Students  
Special Graduate Students are admitted to a specific M.I.T. department to enroll in courses to broaden their educational backgrounds. Special students do not pursue degree-granting programs. Within the TAP, the Executive Committee approves all Special Graduate Student requests and funding is provided by the program.

Students attending M.I.T. have studied in the areas of Highway Transportation, Economics, Electrical Power, Water Resources Planning,

Rural Communications, Urban Transportation, Housing and  
Construction, and Plastics.

### CHAPTER 3. PUBLICATIONS

Many types of publications have resulted from the work and research in the program. Data which has been gathered and analyzed has resulted in working papers, internal reports, papers presented at conferences and Technology Adaptation Reports. A listing of TAP reports from the Cairo University/M.I.T. Program is as follows:

- 78-2      A Guide for the Use of the M.I.T. River Basin Simulation Model, Kenneth M. Strzepek, Roberto L. Lenton and David H. Marks, December 1978.
- 78-3      The Housing and Construction Industry in Egypt: Interim Report Working Papers 1977, The Joint Research Team on The Housing and Construction Industry, Cairo University/Massachusetts Institute of Technology, Spring 1978.
- 78-4      Proceedings/Seminar on Development of New Approaches to Housing Policy and Production in Egypt (January 21-24, 1978), The Joint Research Team on The Housing and Construction Industry, Cairo University/Massachusetts Institute of Technology, Spring 1978.
- 78-5      Theory and Applications of the Multivariate Broken Line, Disaggregation and Monthly Autoregressive Streamflow Generators to the Nile River, Kevin Curry and Rafael L. Bras, September 1978.
- 78-6      Road Transport Analysis in Egypt, Fred Moavenzadeh, Mohammed El Hawary, Michael Markow and Brian Bradmeyer, Winter 1978.
- 79-1      Preliminary Study of the Applicability of Plane Strain Fracture Toughness Test Techniques to Plastic Pipe Materials, P. Flüeler, J. F. Mandell and F.J. McGarry, January 1979.

In addition there have been numerous publications in other series at M.I.T. as well as in the broader professional and public arena. A listing of these publications is contained in Appendix 5.

## PART 4

## ADMINISTRATION AND ORGANIZATION

The administrative organization of the program is undertaken through coordination among: The Office of the Vice Rector for Research and Graduate Studies at Cairo University, the M.I.T. Technology Adaptation Program and the Technological Planning Program Liaison Office established at Cairo University for the direct supervision of program activities in Egypt. The administrative organization of the Liaison Office was established during the first three months, and the office became operational during the second quarter. The coordination among three administrative components is designed to insure that the technical effort achieves the specified goals efficiently, and contractual requirements of AID are satisfied. Below is a summary of the role and function of the principal committees of the program.

- The TAP Advisory Committee, is responsible for advising, overseeing the TAP activities and counsels on M.I.T.'s policies and administrative procedures.
- The TAP Executive Committee formulates general policies for the program, responds to Advisory Committee suggestions, identifies and initiates new program developments, reviews proposals and formulates guidelines for implementation by the TAP Director for the administration of the program.
- The TPP Executive Committee responds to the directives and advice of the Steering Committee, reviews all proposals for Cairo University, and assists the Vice Rector of Cairo University for Research and Graduate Studies in coordinating project activities at Cairo University, and in directing the operations of the Liaison Office.
- The Joint Advisory Committee is composed of the TAP and TPP Executive Committees and one rotating member from each of the Steering Committees. It meets periodically to insure effective coordination of joint M.I.T./Cairo University activities, and plans the organization of the Institute and other bilateral activities.

The Liaison Office was originally established in the Faculty of Engineering. The office space was completely renovated, office equipment and staff were selected during the spring of 1977 and the office was operational four months after the signing of the contract.

In June 1977 Mr. Robert Greene established his residence in Egypt as the Program Administrator. The remaining staffing of the office is Egyptian and is composed of an Administrative Officer, two accounting officers, one assistant accountant, three administrative secretaries, three typists, and a switchboard operator.

An agreement between Cairo University and the Massachusetts Institute of Technology, describing the broad objectives of the TPP was signed on January 16, 1977 by Dr. Soufi Abo Taleb, President of Cairo University and Dr. Walter A. Rosenblith, M.I.T. Provost. A more detailed administrative agreement was signed by Dr. Abo Taleb and Mr. Paul V. Cusick, M.I.T.'s Vice President for Financial Relations. Copies of both these agreements are provided in Appendix 1.

A letter granting the Government of Egypt's approval for tax exempt status of the Program was signed on 3 June 1977 by the Minister of Finance. This exemption insures that all salary payments to Cairo University Faculty members, consultants and program office staff will not become subject to income or professional taxes, and represents a savings of approximately LE60,000 to the program per year.

The Liaison Office, in addition to its function of providing the means through which M.I.T. can meet its contractual obligations to AID, represents an organizational model for the Center. Many policies and procedures developed for the Liaison Office represent management efforts which can be transferable. Examples of these efforts are the "Personnel Policy and Procedures Manual" developed for the Liaison Office. A copy is provided in Appendix 6. The M.I.T. Office of Sponsored Programs and the M.I.T. Comptroller's Office have developed a set of operating procedures, documentation requirements and reporting requirements for the Administration of the Liaison Office. These comply with M.I.T.'s normal accounting practices for government sponsored research projects. The Liaison Office has been organized from the standpoint of financial administration as an M.I.T. field office, reporting directly to the M.I.T. Comptroller. All original documentation is returned to M.I.T. by the field office. All financial reporting to AID is through the M.I.T. Comptroller.

Representatives from the M.I.T. Comptroller's Office visit Cairo regularly to assist with the establishment and development of M.I.T. accounting procedures, to train the Egyptian accountants, and have become familiar with the operations in Egypt such that they serve as a link to the M.I.T. accounting office. Additionally these visits serve as both an audit and quality control function.

In the organizational and administrative design and implementation of this program some basic guidelines have been adhered to. These guidelines are necessary in order to obtain the maximum benefit from both the research and available funds and are as follows:

- The program is administered and governed by tenured faculty. No program administrator is given authority to provide funding approval of projects or to give program direction. Thus peer review of project proposals, research results, and future direction of research efforts provides the maximum quality control.
- Principal Investigators for projects must come from tenured faculty as opposed to non-faculty research staff.
- Projects are approved on a fiscal year basis and it is clear to all parties that continuation of effort depends upon past accomplishments.
- All project budgets and accounting processes are handled through the existing Departmental administrative staffing precluding the necessity to hire staff for each project's administrative requirements.
- The staffing of the Program Office has been held to the minimum, thus maximizing the availability of funds to the research projects.

## PART 5

## INSTITUTIONALIZATION

(Dr. Aly El Salmi, the Director of the Center has prepared this part of the Evaluation Report.)

ESTABLISHMENT OF THE DEVELOPMENT RESEARCH AND TECHNOLOGICAL PLANNING CENTER

According to the agreement with the Cairo University/M.I.T. Technology Adaptation Program, an Institute for Technological Planning was to be established by August 31, 1979. To help establish such an Institute, Cairo University agreed to provide adequate space in order for it to carry out its activities. Cairo University also agreed to the following:

- Provide a full time Director for the Institute and such other full or part-time personnel as may be required;
- Make staff members available to participate in an academic exchange program at the U.S. participating institution; and
- Make staff members available to participate in applied research studies, provide technical advisory services, and serve as instructors.

Cairo University has fulfilled its obligations in this respect. The Development Research and Technological Planning Center (DRTPC) has been established by a University Council's decision on February 28, 1979 which was ratified by a decision of the Higher Council of Universities on May 17, 1979.

DRTPC has been given the form of a Center and not an Institute to conform with the organizational pattern of "autonomous units of special nature", as described in law No. 49 for the year 1972 governing Egyptian Universities. A center of this type is an autonomous body having its own bylaws and is freed from regular governmental financial and administrative

regulations. The Center is not allowed to offer educational degree programs which is a condition that applies to DRTPC. In the future the Center will evolve into the form of an Institute.

The steps which were taken in establishing the Center after the approval of its bylaws are the following:

- a. A Director has been appointed to assume the responsibilities described in the bylaws (a copy is attached in Appendix 7 ). Dr. Aly El Salmi, Professor of Management at the Faculty of Commerce, Cairo University and Ex Minister of State for Follow-up and Control has been selected as Center Director.
- b. The Board of Directors which is the ultimate governing body of the Center has been appointed as follows:
 

Dr. Ibrahim Badran	Cairo University - Chairman
Dr. Aly El Salmi	DRTPC, Director
Dr. M. Sobki Abdel-Hakim	Cairo University, Vice Rector
Dr. M. Fawzi Hussein	Cairo University, Vice Rector
Dr. Zaki Shafei	Cairo University, Professor of Economics
Dr. M. Taher Kheira	Dean, Faculty of Agriculture
Dr. Hassan Ismail	President, Academy of Scientific Research and Technology
Dr. Abdel Razzak Abdel Meguid	Minister of Planning
Dr. I. Helmy Abdel Rahman	Advisor to the Prime Minister
- c. A large part of the University's newest building on Campus has been allocated to house the Center. The necessary number of employees have been appointed to carry out the DRTPC's administrative affairs.
- d. Faculty members from all Cairo University's faculties and institutes have been alerted to actively participate in DRTPC's activities as will be shown in later sections of this part of the report.
- e. Dr. Helmi Namar, Professor of Accounting and Dean of the Faculty of Commerce, who is a public accountant by profession has been assigned the task of auditing the Center's accounts. On the other hand, Mr. Ahmed Amin, Cairo University Secretary General has been designated as the Financial Advisor to the Center.
- f. A Coordinating Committee consisting of Cairo University Senior faculty members is being formed to help the

Center's Director in planning and coordinating activities. (The description of the Committee's functions will follow).

### The Management Organization of the Center

Dr. El Salmi, DRTPC Director has developed an organization structure for the Center which reflects its special nature and characteristics. The proposed structure, yet to be approved by the Center's Board of Directors, has been reviewed by Mr. James J. Culliton, Assistant to the Vice President for Administration and Personnel and Director of Personnel at M.I.T. Mr. Culliton concluded that "the structure and plans for staffing are adequate to meet the objectives specified for the Center".

### Objectives and Activities of the Center

The Center aims at solving developmental problems of Egypt and supporting technological development in the country through applied research and technological planning.

The main objective will be achieved through the following activities:

- To provide a technical research base, help training Egyptian government cadres involved in planning and implementation of development projects.
- To improve academic resources in Egypt in order to apply research for the analysis and solution of development problems.
- To create a permanent framework, through which to direct applied research and training capacity towards solving development problems and technology adaptation for development purposes in Egypt.
- To provide methods for analysing programs of economic, social, and technical development with the help of associated institutions.
- To provide technical consultation to the Egyptian Government Ministries in identifying and modeling development problems and devise applicable solution programs.
- To train Egyptians at the associate foreign institutes.

- To organize conferences, symposiums and meetings, as consistent with the above objectives.

### Major Areas of Interest

The Center perceives the development phenomenon from an integrated and interdisciplinary approach. Therefore, areas of major interest to the Center can be outlined as follows:

- Technological planning, transfer of technology and technology adaptation.
- Educational technology.
- Regional and local planning and the related topics of urban-rural development.
- Improving population programs.
- Health care delivery systems and improving health conditions.
- Management development.
- Energy planning and new energy supplies.
- Macro-economic planning and socio-economic studies.

### Administration

The Center is a unit of autonomous nature. It is directed by a board of directors headed by Cairo University Rector. It has a full time director and necessary supporting staff. The Center's organization structure is as follows:

- A. Top Management: made of the following organizational units:
  1. Board of Directors
  2. Chairman of Board of Directors
  3. Director of the Center, who has the following units linked to him:
    - a. Program Coordinating Committee
    - b. Organizational sections, which contain operations section, information section, and financial and administrative section.

B. Operations Section: which contains the following programs:

1. Energy studies program
2. Health studies program
3. Technological planning program
4. Population studies program
5. Educational technology program
6. Management development program
7. Economic studies program

C. Information and Communication Section: which contains the following units:

1. Informatio and computer
2. Library and documentation
3. Scientific publications
4. Scientific relations

D. Supporting Activities Section:

1. Budget and accounts
2. Personnel affairs
3. Secretarial and Administrative services
4. Public relations

### Basic Features of the Center's Organization

- The structure is mainly based on the program concept i.e. it avoids dividing the Center into departments. The program is the core organizational unit both in the technical areas of research, consulting and training on the one hand, and in the supportive activities area.
- The planning and coordinating functions are mainly assigned to the program Coordinating Committee which has as its main responsibility the integration of the Center's operations into a meaningful work plan.
- The Director's span of management and control is logical as he deals basically with program coordinators with respect to the technical activities. In due course it is possible to have two senior assistants to the director, one for the supporting activities including financial and administrative issues.

Upon the approval of the Board of Directors, the full range of

policies, systems and procedures for directing the Center's activities will be enacted. They are mainly the following:

- a. A personnel policy manual
- b. Position descriptions for Center staff
- c. A financial policy manual
- d. An accounting and budgeting system

The above mentioned policies and systems were designed by Cairo University faculty members with due consultation with concerned M.I.T. staff.

#### The Physical Facilities of the Center

The Center has moved to its new building recently. The physical facility available to the Center is a three story building of approximately 3,500 square meters. The building is worth no less than LE 2 million at current prices. The available space has been allocated as follows:

- The library
- Two main seminar rooms each accommodating up to 150 participants.
- Four conference rooms each accommodating up to 40 persons.
- Office spaces for the CU/M.I.T. Liaison Office, the Executive Committee, and M.I.T. visiting staff members.
- Office spaces for the 13 ongoing research projects of the CU/M.I.T. program.
- Office spaces for the new projects that have started after establishing the Center, namely
  - The Waxy Asphalt Project
  - The New Al-Amal City Project
- Office spaces for the Center's Director, Program Coordinators, Board of Directors, and administrative staff.

The whole room surfaces have been wall-to-wall carpeted, and room air conditioners already installed. There

DEVELOPMENT RESEARCH AND TECHNOLOGICAL PLANNING CENTER (DRTPC)

CAIRO UNIVERSITY

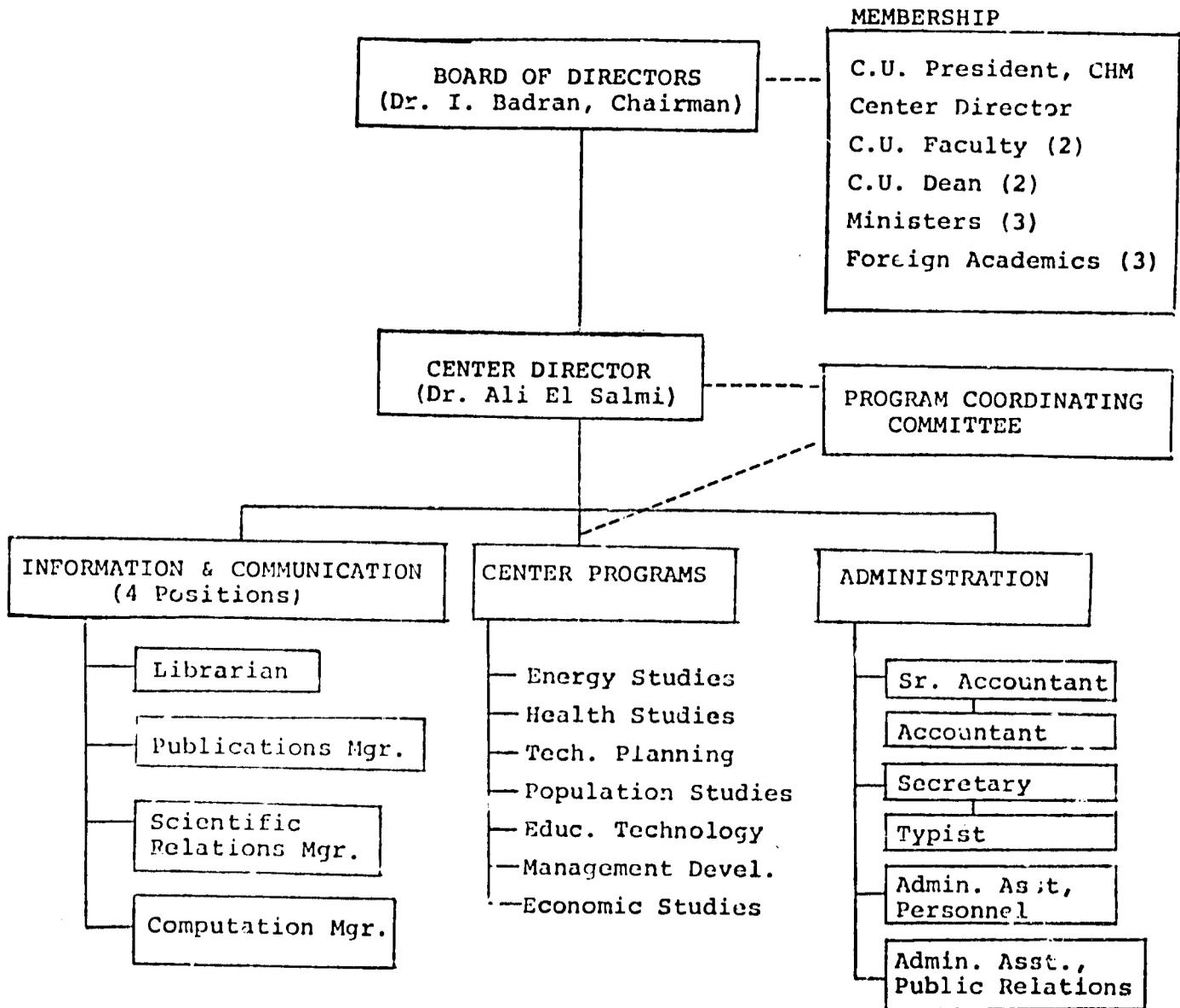


Figure 2

are now projects underway to have the two main seminar rooms equipped with the necessary audio-visual aids to get them ready for the Center's activities. It is also planned to officially inaugurate the Center's building next January 1980 taking advantage of two major events that are being planned now:

- The joint Cairo University/M.I.T. Conference that will be attended by the principal investigators of the 13 projects and the most directly involved faculty members from both sides, in addition to key officials from the participating ministries.
- The Cairo University/University of Pennsylvania Joint Workshop on Local Government and Regional Development.

#### The Research Organization of the Center

The Center is organized along the "Program Concept". Each program reflects a major area of interest that bears directly on the development process in Egypt. It is clear that the Center being basically research oriented, cannot be organized along the traditional way of departmentalization. The essence of the research organization is the "Program" which is a rather flexible way of grouping different types of activities that are reasonably and scientifically interrelated or even integrated.

As outlined before seven such programs have been identified on the basis of a thorough analysis of the country's developmental problems, and the most pressing needs of the Egyptian people. The chosen programs are briefly described as follows:

- The Technological Planning Program is a continuation of the crux and major theme of the CU/M.I.T. Technology Adaptation Program. It emphasizes the importance of studying, formulating and implementing science and technology related issues. This program stresses engineering and economic analysis, and uses an interdisciplinary approach for developing action programs that focus on social issues and overall economic policies.
- The Economic Studies Program emphasizes the overall or macro economic issues of Egypt, and aims at studying such topics as income distribution, economic management, government policy interventions, monetary and fiscal policies, the operations and performance of the banking

systems, wages and prices, employment, resource allocation and related topics.

- The Energy Studies Program deals with the issues of energy generation and consumption and the different alternative strategies for conserving energy and rationing its consumption. New sources of energy such as solar energy, wind energy, and petrogas warrant special attention.
- The Educational Technology Program is concerned with upgrading educational systems and technologies on the premise that education is a decisive factor in national development. University administration, curriculum development and upgrading evaluation techniques are among the most important issues in this program.
- The Population Studies Program intends to deal with the population factor in national development. The overriding objective is to try to assess the validity of the national population policy and the applied measures of family planning. Manpower planning and development, training, labor force composition and migration are among the interests of the population program.
- The Health Studies Program deals with problems of describing and evaluating health care delivery systems in both urban and rural areas of Egypt as they relate to the development problem. Hospital administration, pricing of health services, continuing education for the medical professions, and the macro organization of the health care system in Egypt are important issues in this program.
- The Management Studies Program is highly interested in studying management problems and assessing their negative impact on the developmental goals and the extent of their achievement. Public management is the focus of this program due to the special role played in Egypt by the government and the public enterprises. Local Government and the decentralization process is also one of the main interests of the program.

Each of the above programs represents the overall framework out of which several specific projects will spring. For each program there will be a senior faculty member serving as a coordinator. The program coordinator has the following responsibilities:

- Prepare a general outline of the subject and the content of the program.

- Nominate a work-group for the program from the Cairo University teaching staff, which prepare Data Base explaining the new ideas and research, in the fields of the program, which is related to the developing status of Egypt.
- Direct the work-group to prepare a research, consulting and training plan in the fields of the program.
- Project identification
- Revision of consulting tasks and research contracts which are involved in the field of the program and which are requested by external agencies.
- Nominate members of research groups who will be responsible to achieve projects within the field of the program.
- Follow up progress in the projects done within the field of the program.
- Insuring the required level of coordination between the different programs through his membership in the Program Coordinating Committee.

The following have been nominated as program coordinators:

- Prof. Amr Mohie-Eldin, Coordinator of the Economic Studies Program.
- Prof. Mohamed El Hawari, Coordinator of the Technological Planning Program.
- Prof. Salah El Sobki, Coordinator of the Energy Studies Program.
- Prof. Abdel Salam Abdel Ghaffar, Coordinator of the Educational Technology Program.
- Prof. Atef Ebied, Coordinator of the Management Studies Program.
- Prof. Aziz Bindary, Coordinator of the Population Studies Program.

The Coordinator for the Health Studies Program is still to be nominated. Generally speaking, the program approach to the Center's research organization is quite flexible and dynamic so that it can accommodate the emergence of new programs or the modification of existing ones.

## The Center's Research Plan and its Sources of Funding

The Center is developing its first research plan for the year 1979/1980. Selected research topics have been assigned to able and interested faculty members to develop solid and workable proposals. The selection of research topics has been performed by the program Coordinating Committee after reviewing the ongoing projects under the CU/M.I.T. program and considering the most important issues challenging Egypt's developmental efforts as demonstrated by different sources of information both local and foreign. The topics that are being prepared and the respective principal investigator in charge are as follows:

<u>Topics</u>	<u>Principal Investigators</u>
1. The population problem in Egypt in view with Socio-Economic and political variables after the Peace Era.	Prof. M. Sobki Abdel Hakim, Vice Rector, Cairo University and Professor of Demography.
2. Evaluation of the Role played by Regional Universities in local development.	Prof. Sayed Kheirallah, Dean, Faculty of Education, Mansoura University
3. Measuring and evaluating economic efficiency of public enterprises in Egypt.	Prof. Amr Mohie-Eldin, Professor of Economics Prof. Aly El Salmi Professor of Management
4. A study of income distribution in Egypt.	Prof. Amr Mohie-Eldin Professor of Economics
5. The macro organizational structure of government in view with the Open Door Economic Policy and the Local government movement.	Prof. Hassam Tewfik Professor of Economics
6. The macro management patterns of Urban Health Care Delivery Systems in Egypt.	Prof. Mahmoud Sherif Professor of Surgery, Cancer Institute
7. The nutritional effects of food subsidies in Egypt.	Dr. John O. Field Tufts University, U.S.A.
8. A study of management information systems in higher education and research institutes in Egypt.	Dr. Aly El Salmi and Dr. Ibrahim Farag

Topics (cont'd.)Principal Investigator (cont'd.)

- |  |   |
|--|---|
| 9. A study of national sources and applications of energy. | Prof. Salah El Sobki<br>Professor of Electrical Engineering |
|--|---|

For each of the above projects, the Center is seeking the collaboration of concerned ministries or agencies for both participation in the research activity and funding purposes. The Center is engaged now in establishing regular contact with the following agencies for the above mentioned reasons:

- The Academy of Scientific Research and Technology
- The Family Planning and Population Agency
- The Ministry of Education
- The Higher Council of Universities
- The Ministry of Planning
- The Ministry of Electricity and Energy
- The Ministry of Petroleum
- The Ministry of Industry
- The General Organization for Industrialization (GOFI)
- The Ministry of Reconstruction and New Communities (MODANC)
- The General Organization for Physical Planning (GOPP)
- The General Secretariat for Local Governance
- The World Bank
- The International Labour Office (ILO)
- The International Association of Schools and Institutes of Administration
- African Research Centre in Administration for Development (CAFRAD)
- American Management Association
- UNESCO

The World Bank has shown great interest in having joint research projects between its Development Research Center (DRC) and the DRTPC. A proposal on income distribution in Egypt is being prepared now for that purpose.

## Current Negotiations with Egyptian and Foreign Organizations

There are several research, consulting and training activities that are now in different stages of negotiations between the Center and some Egyptian and foreign organizations. The status of each project is as follows:

### a. The New Al Amal City Study:

GOPP has given the Center a contract totaling LE 172,000 to conduct a comprehensive study for the new city "Al Amal" "The Hope". Some 25 faculty members of different faculties and departments in Cairo University are involved in this study. It includes the following tasks for the new city:

- Survey Work
- Urban Planning
- Geographical & Geotechnical Study
- Traffic & Transportation Engineering Study
- Roads & Highways & Railways Study
- Community Facility Study
- Housing Study
- Water Resources & Water Treatment & Distribution Study
- Waste Water & Solid Waste Study
- Architecture Planning
- City Planning
- Environmental Planning
- Demographical Study
- Landscaping
- Urban Sociological Study
- Agro Planning
- Industrial Planning
- Power and Energy Study
- Tele-Communication Study
- Legal Study
- Economic Feasibility Study
- Cost Analysis
- Management Study

The contract was signed on October 15, 1979 and the study is scheduled to last for one year.

- b. The Egyptian Cement Office (ECO) has requested the Center to conduct a study to find out the most suitable ways of marketing locally produced cement, and to design a network of distribution centers all over the country that satisfies the demand at the minimum total cost. The study also covers pricing of cement, the administrative organization of the ECO and the building a mathematical model for solving the distribution problem. An offer totaling approximately LE 120,000 has been submitted and is being reviewed by the management of the office.
- c. The General Organization for Roads and Waterways, (Ministry of Transportation) has requested the Center to conduct a comprehensive study on how to design a total program for the maintenance of the Delta roads and highways. A proposal has been submitted to the client.
- d. The Family Planning and Population Agency has informed the Center that the following research topics are highly important and that they would consider funding them:
  - The capacity of Giza Governorate to absorb population.
  - Population redistribution in Egypt.
  - Changing behavioral patterns of population in Egypt (urban-rural).
  - Variables effecting rural migration in Egypt.
- e. The United Nations Fund for Population Activities (UNFPA) has shown great interest in the Center and promised funding a huge project aiming at evaluating Egypt's National population policy. A proposal is being prepared and due for review by the Fund's mission coming to Cairo late November 1979.
- f. A proposal on "The Role of Women in Employment" has been submitted at the request of the ILO. An ILO representative is due to arrive on October 25, 1979 for negotiations with the Center.
- g. Two research projects will be conducted jointly with Centre D'Enseignement Supérieur Des Affaires in France. One project deals with hospital administration and the second studies the investment environment in Egypt. The French Centre will finance both projects.

- h. A detailed cooperative program with the University of Pennsylvania has been prepared. It includes the following areas:

- Dental Medicine
- Veterinary Medicine
- Bio-Medical Engineering
- Local Government and Regional Development
- Management Training

The first project to be executed in this cooperative program is a workshop "on local government and regional development in Egypt" to be held between 6-12 January 1980 in the Governorate of Fayoum near Cairo. Five Egyptian agencies are participating in the workshop in addition to the DRTPC and University of Pennsylvania School of Public and Urban Policy (SPUP).

The DRTPC is also negotiating with the Wharton School of the University of Pennsylvania a comprehensive management education program.

- i. Extensive joint work has been going on for some time between the Center and Boston University. The objective was to design a project that aims at upgrading medical education at Cairo University through a system of research based continuing education for the members of the medical school. The project makes use of the facilities available to Cairo University in its "Learning Resources Center" and utilizes the various health units in rural Egypt that belong to the Ministry of Health. The combined effort has produced a solid proposal and efforts are directed now to secure the necessary funding for the project to get started.

#### Other Activities Planned for the Period 1979/1980

In addition to the research plan, the Center is preparing for the following activities to take place during the rest of 1979 and the year 1980:

- a. Conferences and Workshops
- Workshops on "The Appropriate Technology for Egypt"

- Workshop on "Approaches to Staff Development in Egyptian Universities"
- Workshop on "Information Management and National Development in Egypt"
- Workshop on "The Concept of Reconstruction and New Settlements in Egypt."

b. Management Training Programs

The Center will start in December 1979 to offer management training program addressed to management personnel at the top and middle levels and in specialized managerial functions in specific sectors of economic activity.

The distinguishing features of the DRTPC's management training programs would be the following:

- They have a research base, as they are built around the findings and recommendations of the different research projects conducted in the Center.
- They are tailor-made to suit the needs of management personnel in a homogenous group of functions or enterprises.
- They are action oriented stressing problem solving, and calling for a larger degree of active participation on the part of the trainee.

The Center is planning to offer such a program with the collaboration of the Sloan School of Management at M.I.T. and the Wharton School of the University of Pennsylvania.

c. Publications

The Center plans to produce two series of publications:

- Scientific Papers

Which is a series of short papers to present the most important scientific contributions of Cairo University faculty members

through their work with the Center. This series is intended to address the sophisticated scientific community.

- General Reports

Which is intended to be a medium to communicate to the general public in ordinary language the research findings and policy implications of the Center's studies on developmental problems.

### The Center's Financial Strategy

As an autonomous body, the Center has the opportunity to diversify its financial resources. There are several such sources:

- a. Income generated through the Center's activities and services rendered to government agencies and public enterprises. In this respect a total amount of LE 50,000 will be contributed by the Ministry of Planning, the Ministry of Reconstruction and New Settlements, the Secretariat General of Local Governance and the Academy of Scientific Research and Technology to cover the expenses incurred by the Center in organizing the forthcoming workshop on local government and regional development.
- b. Direct funding of research projects by concerned Egyptian and foreign organizations. Egyptian road companies have already contributed LE 30,000 to the Waxy Asphalt project.
- c. Sponsored research programs. The Center is seeking funds from agencies like the Ministry of Higher Education and the Academy of Scientific Research and Technology to finance research projects proposed by junior university faculty members and graduate students.
- d. Contribution from international funding agencies.
- e. Donations from local and foreign organizations. The Family Planning and Population Agency has already donated LE 20,000 and the equivalent of \$10,000 of office furniture and equipments.

The Center also has developed an overhead policy to be used when negotiating contracts so as to contribute to its fixed and indirect costs.

## The Staffing Plan of the Center

Position descriptions for the various job titles included in the organization structure are now being prepared. They will be used as benchmarks in selecting the Center's employees. Assuring quality and appropriateness of qualifications to job requirements is the guiding principle in personnel selection. It is projected that the various job titles will be filled no later than the end of 1979.

## PART 6

## GENERAL ASSESSMENT OF THE PROGRAM

In providing a general assessment of the program it is perhaps meaningful to reflect upon the expectations of the various parties to the program at its initiation. These expectations can be grouped into the three major objectives:

1. Increase the participation and orient the research capability of Cairo University faculties in applied research toward Egyptian development goals.
2. Increasing the capacity of the ministries to develop an appreciation in project identification, evaluation and sector level planning.
3. Institutionalize the effort such that it can become self sustaining.

For the first of these objectives, it was the expectation of the program that a research capability at Cairo University would become available which could work with government officials and ministries on meaningful projects. This goal has been highly successful as measured by the vigor and enthusiasm of all levels at Cairo University from the Rector to the participating faculty members. The thrust of the program and its dedication to the resolution of current Egyptian problems has created a strong desire on the part of Cairo University faculty for an opportunity to participate in the program. On the part of the Cairo University faculty the program through its research projects, the educational opportunities provided by conferences, workshops, and seminars, as well as the visiting fellows program, has upgraded the technical quality of the faculty, provided a source of financial aid to both students and faculty and has developed a nucleus of people who have an awareness of the contributions which can be made to resolving development problems in Egypt. The professional ties and relationships with M.I.T. faculty are solid and long lasting.

With regard to the second objective it was the expectation of the program that the quality of the human resources of the ministries be upgraded so that AID could work with them on well-conceived and

well-prepared projects. The success of the program in this area has been mixed. In the transportation area two separate contracts were entered into with AID on areas which were extensions of the existing program. These, however, are the only examples.

The effort of the project participants has been directed towards additional project funding from sources other than AID. As shown by such programs as the Ministry of Health's involvement in the direction of the Health Care Delivery project, the World Bank's positive evaluation of the economic evaluation as provided by the transportation projects, and the Minister of Electricity's personal interest in the scope of the Electricity project. Within some of the ministries it is apparent that through the project research and the educational opportunities provided, that an upgrading of the technical personnel as well as positive direction of their efforts has occurred. The bridge between the academic research community and the ministries has been made. On the part of the M.I.T. participants many professional relationships have been developed. Unique areas of involvement have created an environment where a better understanding of the problems of developing countries has occurred.

The institutionalization effort, by its very nature, is the last objective addressed by the program; progress to date has been excellent. A Center has been established which is autonomous and free from bureaucratic constraints. Staffing, procedures, and financial management systems are being developed. The Center appears to be pointed in the proper direction, however, additional time and experience in conducting research projects is necessary before a full evaluation can be made.

#### Conclusions and Findings

- The Program has been successful in achieving its major objectives. The impact upon the Cairo University faculties has been the greatest. The Ministry impact has been slower in development and is varied depending upon the project. The institutionalization of the effort has begun and appears pointed in the proper direction. Evaluation of its accomplishments needs to be undertaken at the next evaluation.

- The projects have had an impact upon larger programs underway in Egypt. At a relatively low cost some projects, e.g. transportation, housing, electricity, water resource planning are bringing to bear assistance and answers to large scale projects funded by the GOE and other lending institutions.
- The interdisciplinary involvement of some projects, specifically Labor Migration, Housing, Rural Communications, Electricity and Water Resources have pointed out the need for a greater effort in cross-fertilization of the individual project accomplishments.
- Because of the availability of accurate, reliable and current data which impacts on development needs, a need exists for a consolidation and rapid retrieval capability of these data in addressing the pressing problems of Egypt's development. This function is planned for one of the most significant contributions of the newly established Center.
- The successful impact of technical educational training experiences within the program has demonstrated its worth and suggests that in future efforts funding should be available for course development initiatives within Cairo University and for management training within both the Ministries and Cairo University.

## APPENDIX

- Appendix 1      Cairo University/M.I.T. Agreements
  
- Appendix 2      Evaluation Plan
  
- Appendix 3      Projects, Principal Investigators and  
Ministry Officials
  
- Appendix 4      Response to Evaluation Questionnaire
  
- Appendix 5      Publications
  
- Appendix 6      Personnel Policy and Procedures Manual
  
- Appendix 7      Bylaws of the Center
  
- Appendix 8      Program Administration and Personnel
  
- Appendix 9      Decision No. 153 of Rector, Cairo University  
dated 2/10/1979

AGREEMENT

between Cairo University and the Massachusetts Institute of Technology for the establishment of a Technological Planning Program,

Recognizing that benefits can accrue to both parties from the development of cooperation in the field of Technological Planning,

Wishing to assist in establishment of closer and more regular cooperation between faculties and students of both parties,

Taking into consideration that such cooperation will serve to strengthen friendly relations between the United States of America and the Arab Republic of Egypt.

Have agreed as follows:

ARTICLE I

The objective of this cooperation is to assist Cairo University in contributing to the formulation and implementation of technical programs which will help to achieve the development goals of Egypt. This objective is to be achieved through the interaction of faculty and students of the Massachusetts Institute of Technology with their Egyptian counterparts in research teams, seminars and workshops and through mutual visits. The successful achievement of this goal will facilitate the establishment of an Institute of Technological Planning at Cairo University which will develop a body of technical, economic and social science expertise in the general area of technological development.

## ARTICLE II

The initial phase of this project, for which the U.S. Agency for International Development has provided \$790,000 and LE 433,000, will be for one year subject to possible extensions in order to determine the feasibility of the Program. During this phase a Technological Planning Liaison Office will be established to support the Cairo University/M.I.T. Technological Planning Program. The details of the Program and its budget are described in M.I.T./Cairo University Development Planning Program (AID Contract NE-C 1291) which is appended to this agreement.

## ARTICLE III

The specific objectives of the initial phase of the program are:

1. To initiate and coordinate academic interest in Cairo University in cooperating with Egyptian government agencies in organizing and expanding investigations on specific development issues.
2. To cooperate with ministries and other agencies in expanding their capabilities to perform sector-level planning, project identification and evaluation, and establish priorities.
3. To establish an institutional framework associated with Cairo University which will provide the ministries with the latest research findings in the fields of technological planning and project evaluation.

To accomplish these objectives, the program will address a set of specific development programs of current concern to the participating ministries.

#### ARTICLE IV

Three general analytic approaches will be utilized on the specific projects developed under this program:

1. Engineering analysis will address specific, technical issues including availability and quality of needed resources, facility size and location, appropriateness of selected technologies, identification of feasibility issues and criteria for detailed pre-investment project analysis.
2. Economic analysis will focus on project, sector and national planning issues, economic and financial cost/benefit analyses will be employed for project evaluations. Sector studies will be used to identify potential projects and to integrate specific projects with overall planning objectives.
3. Social systems analysis will focus on social issues and overall policy formation. Specific topics will include population planning, demographic and manpower studies, social services and technology transfer studies.

#### ARTICLE V

The agreement is to be carried out by the Technology Adaptation Program of M.I.T. (on behalf of the Massachusetts Institute of Technology) and by the Office of Vice Rector for Research and Special Programs (on behalf of Cairo University). For the implementation of this agreement a Joint Advisory Committee consisting of members of the Executive

Committee of the Technology Adaptation Program at M.I.T., the Director of the Technological Planning Liaison Office and two senior faculty members of Cairo University will be established. This Committee will periodically review the progress of the program, insure that specific activities are in keeping with the objectives of the program, and advise the Vice Rector of Cairo University and the Program Director of the Technology Adaptation Program in matters pertaining to the direction and potential new areas of investigation for the program.

#### ARTICLE VI

M.I.T. and Cairo University will provide appropriate physical space in their respective campuses for this program and through appropriate means encourage the participation of their faculties and students in the program.

#### ARTICLE VII

Nothing in this agreement shall be interpreted to prejudice other agreements in the fields of Technology Planning between the Parties.

#### ARTICLE VIII

This agreement shall enter into force upon signature and shall remain in force during the first phase of the Cairo University/M.I.T. Technological Planning Program. During this first phase the program

will be evaluated by the two institutions as well as by the U.S. Agency for International Development. The agreement may be modified, terminated, or extended with the mutual consent of the Parties.

x x x

Drawn upon and signed the 16th day of January, 1977, in duplicate one copy in Arabic and one in English, both texts being equally authentic.

For the Massachusetts Institute  
of Technology

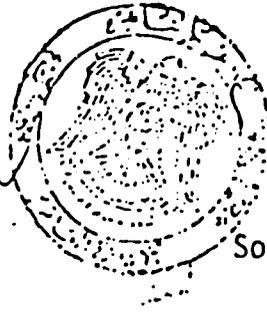


*Walter A. Rosenblith*

Walter A. Rosenblith

Provost

For Cairo University



*Soufi Abu Taleb*

Soufi Abu Taleb

President

بين جامعة القاهرة ومعهد ماساتشوستس للتكنولوجيا

لائحة برنامج للتخطيط التكنولوجي

نظرا للفوائد التي تعود على الجانبين من تنمية التعاون في مجال التخطيط التكنولوجي ،  
ورغبة في ترسيخ وتنظيم التعاون بين أعضاء هيئة التدريس والطلاب في كلا الجانبين ، مع الأخذ  
في الاعتبار ان مثل هذا التعاون من شأنه ان يوطد علاقات الصداقة بين الولايات المتحدة الامريكية  
وجمهورية مصر العربية .

وافق الجانبان على ما ياتي :

### مادة ( ١ )

ان هدف هذا التعاون هو مداونة جامعة القاهرة في صيانة وتنفيذ البرامج الفنية التي تساهم  
في تحقيق اهداف التنمية في مصر ، وذلك عن طريق التفاعل بين أعضاء هيئة التدريس والطلاب في معهد  
ماساتشوستس للتكنولوجيا وبين نظرائهم في جامعة القاهرة ، في شكل مجموعات بحثية وقاعات بحث وورش  
عمل وزيارات متبادلة . ان تحقيق هذا الهدف بنجاح سيهد السبيل لانشاء معهد للتخطيط  
التكنولوجي بجامعة القاهرة ، يكون بمثابة نواة لتكوين هيئة متخصصة في علوم التكنولوجيا والاقتصاد  
والاجتماع تقدم الخبرة في مجال التنمية التكنولوجية بصفة عامة .

### مادة ( ٢ )

وقد خصصت الوكالة الأمريكية للتنمية الدولية ٧٩٠٠٠٠ دولار امريكي و ٤٣٣٠٠٠ جنية مصري  
لتنفيذ المرحلة الاولى من هذا المشروع ، التي تستغرق سنة واحدة قابلة للحد من اجل تقرير جدوى  
هذا البرنامج . وتم خلال هذه المرحلة انشاء مكتب اتصال للتخطيط التكنولوجي ، يشرف على البرنامج  
لمشارك التخطيط التكنولوجي بين جامعة القاهرة ومعهد ماساتشوستس للتكنولوجيا . ويرجع المبلغ  
الموافق لهيئة الاثاقية ثنائي البرنامج والبرنامجه (منذ الوكالة الامريكية للتنمية الدولية رقم



من قدامى اعضاء هيئة التدريس بجامعة القاهرة . وتناول هذه الالجنة متابعة تقدم العمل في البرنامج  
والتمتعين من تطابق الانشطة المحددة مع اهداف البرنامج ، وتقديم المشورة لانايب رئيس جامعة القاهرة  
ومدير البرنامج ، وبرنامج تطوع التكنولوجيا في الامور المتعلقة بمجالات البحث الجديد . في هذا البرنامج

#### مادة (٦)

=====

يختص كل من معهد ماساتشوستس للتكنولوجيا وجامعة القاهرة بقرا لهذا البرنامج في حرمها  
الجامعي ، كما يقرر كل منهما باستخدام الوسائل اللازمة لتشجيع اعضاء هيئة التدريس والطلاب على  
المشاركة في البرنامج

#### مادة (٧)

=====

لا تتعارض هذه الاتفاقية مع اية اتفاقيات اخرى بين الجانبين في مجال التخطيط التكنولوجي

#### مادة (٨)

=====

يبدأ تنفيذ هذه الاتفاقية فور التوقيع عليها ، وسيجري مفعولها خلال المرحلة الاولى من برنامج التخطيط  
التكنولوجي بين جامعة القاهرة ومعهد ماساتشوستس للتكنولوجيا .  
ويجري تقييم البرنامج خلال المرحلة الاولى بواسطة المعهد من فضلا عن الوكالة الايركية للتنبؤ  
الدرابية . وفي نهاية المرحلة الاولى يمكن تعديل الاتفاقية او مدها بناء على موافقة الطرفين  
وضعت هذه الاتفاقية ووقعت في ١٦ يناير ١٩٧٧ من نسختين نصيتين احداهما باللغة  
العربية والاخرى باللغة الانجليزية .

عن معهد ماساتشوستس للتكنولوجيا



Walter A. Rumlitz

( والتر أ . رومليت )

عن جامعة القاهرة ،



( د . صدى أبو طالب )



MASSACHUSETTS INSTITUTE OF TECHNOLOGY

77 MASSACHUSETTS AVENUE ROOM E19-702  
CAMBRIDGE, MASS. 02139

OFFICE OF SPONSORED PROGRAMS

TELEPHONE (617) 253-

Administrative Agreement between Cairo University and M.I.T.

ADMINISTRATIVE AGREEMENT between Cairo University and the Massachusetts Institute of Technology for the establishment of a Technological Planning Program, hereinafter known as "The Program."

ARTICLE I - OBJECTIVE

The objective of this administrative agreement is to define the administrative arrangements between The Program at Cairo University and the Technology Adaptation Program at the Massachusetts Institute of Technology in support of the MIT/Cairo University Technological Planning Program described in AID Contract No. NE-C-1291 and in the agreement between MIT and Cairo University dated January 16, 1977, both of which are appended and serve as a basis for this administrative agreement.

ARTICLE II - ADMINISTRATION

The Massachusetts Institute of Technology will administer the Egyptian Pounds in the amount of LE 373,000 being provided by U.S. AID under the terms of this contract and the Administrative Officer of the Liaison Office will be responsible for all disbursements and for maintaining all financial records, purchase orders and invoices in accordance with MIT's standard accounting procedures established by the MIT Office of Sponsored Programs.

ARTICLE III - AUTHORIZATIONS

The Vice-Rector of Cairo University and the Program Director from MIT, will jointly authorize all Egyptian Pound expenditures for the project teams engaged in the joint research projects by jointly approving individual budgets.

ARTICLE IV - REIMBURSEMENT OF INDIRECT COSTS

The Program will reimburse Cairo University for the indirect cost, including fringe benefits, for certain faculty and administrative staff at the rate of 109% of such salaries and/or consulting fees. Such reimbursement is provided only for full-time faculty and/or administrative staff (excluding graduate students) for their direct participation in the joint research project.

Payment will be made monthly, to an account designated by Cairo University, based on salaries and/or consulting fees paid during the prior month.

ARTICLE V - OFFICE SPACE, FURNITURE & EQUIPMENT

Cairo University has provided office space, furniture and equipment as required for the Liaison Office. Renovations to this space and the purchase of some office furniture and equipment have been made with the understanding that the cost of these items will be deducted from the reimbursement of the indirect costs payable to Cairo University. This equipment plus equipment purchased from The Program's U.S. dollar and Egyptian budgets, such as a telex machine, typewriters, a copy machine and air conditioners become the property of Cairo University when delivered to Cairo University. They will be used by The Program during the period of its operation in Egypt.

ARTICLE VI - EGYPTIAN TAXES AND DUTIES

It has been determined that equipment purchased from Program funds and donated to Cairo University -- as described in Article V -- are exempt from Egyptian taxes and duties.

Further, The Ministry of Finance of the Arab Republic of Egypt issued a specific interpretation of the Program's tax status on May 21, 1977. A copy of this interpretation is appended as a part of this Administrative Agreement. The major points are summarized as follows:

1. American and Egyptian employees and consultants are tax-exempt.

Agreement - 3

2. Personal effects of M.I.T. resident staff including one automobile, are exempt from customs duties - providing goods imported into Egypt are re-exported within six months after the termination of their contracts.

ARTICLE VII - PERIOD OF AGREEMENT

This agreement shall enter into force upon signature and shall remain in force during the first phase of the Cairo University/ MIT Technological Planning Program. During this first phase The Program will be evaluated by the two institutions as well as by the U.S. Agency for International Development. The agreement may be modified, terminated, or extended with the mutual consent of the Parties.

For the Massachusetts Institute  
of Technology



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Stuart H. Cowen  
Vice President for Financial  
Operations

For Cairo University



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Prof. Hassan Hamdy Ibrahim  
Vice President of Higher Education and  
Research, Cairo University

EVALUATION PLAN

CU/MIT TECHNOLOGICAL PLANNING PROGRAM

PROJECT GRANT AGREEMENT 263-0061

CONTRACT AID/NE - C - 1291

## 1.0 BACKGROUND

In December of 1976 AID entered into a one-year contract with M.I.T. to establish a collaborative research effort with Cairo University and various ministries of the Government of Egypt to improve their capabilities in analyzing, planning and managing work on important Egyptian developmental problems. During the same period the feasibility of institutionalizing the process was to be examined. The success achieved in this course of the contract warranted an extension with funding until October 1980 and program approval for an additional three years. The means by which the general objectives are pursued is through cooperation with Cairo University in developing its capabilities to contribute to the formulation and implementation of science- and technology-related policies designed to assist Egyptian development goals. To this end, three specific objectives have been pursued:

- 1) mobilization of academic interest in research on specific development plans;
- 2) organization of technical research in collaboration with Egyptian Government Ministries; and
- 3) establishment of an institutional framework through which permanent research and training capability can be organized.

The specific research projects organized so far employ three general analytic approaches:

- 1) engineering analysis and technical project evaluation, addressing specifically technical issues, including field and laboratory studies, design, training requirements, etc.;
- 2) economic analysis, focusing on project, sector, and national planning issues, and micro- and macro-economic

- studies related to specific Egyptian development programs; and
- 3) social science analysis of population and labor force issues, socioeconomic change including urbanization, extension of social services, technology transfer, and strategies.

Over the past 30 months, 14 collaborative projects have been developed between M.I.T. faculty members and their counterparts at Cairo University and the appropriate Ministry or Government agencies. They focus on a broad range of engineering, economic, and social science topics, as described below. The key element in each of these efforts is the interdisciplinary team drawn from faculty and staff from M.I.T., Cairo University, and Government Ministry personnel responsible for planning development projects in the topic area. Effective mobilization of the Egyptian academic and government resources has been one of the principal reasons for the success of the Program to date. In addition to the research activities, emphasis has been placed on the training of in-country personnel in the techniques of project identification, evaluation, and management, and the development and maintenance of the data necessary to design and monitor their projects.

The research projects have focused principally in four broad areas:

- 1) Energy, including electricity generation and distribution;
- 2) Manufacturing, including small scale industries, plastics and building materials;
- 3) Public Works, including housing, transportation, and water resources;
- 4) Socio-Economic Development, including population migration, health care delivery, economic planning and rural communications.

An evaluation of the program is required under the terms of both the Direct AID Contract with M.I.T. and the Project Grant Agreement.

## 2.0 OBJECTIVE OF THE EVALUATION PLAN

In the course of conducting this evaluation the following objectives will apply:

- 1) To assure that both the technical and non-technical objectives are being identified, appreciated and addressed.
- 2) To measure the validity of the overall program concept and determine which approaches seem to be the most effective.
- 3) To identify any changes or actions that could improve efficiency.
- 4) To identify additional needs that remain before the longer term goal can be met.

## 3.0 ORGANIZATION OF THE EVALUATION

Figure 1 provides a flow chart which will be used to provide the focus for the evaluation. The design of the evaluation plan is most readily explained by describing that information which will be gathered and evaluated.

### 3.1 INPUT

The input section on Figure 1 will contain material which is descriptive in nature. It will summarize the kinds and quantities of resources which have been applied to the program, it will describe the organizational structures which have been established, and it will discuss

the control mechanisms which have been initiated to assure accountability. The section will be factual and no attempt will be made to evaluate performance at this stage of the evaluation process.

### 3.2 ELEMENTS

In this plan five elements are utilized to provide the basis for evaluating the effectiveness of the program in attaining the objectives and goals. Four of these elements are groupings of research projects. The fifth element is the Liaison Office at Cairo University. These five elements have utilized the inputs and have produced outputs which have influenced the Program's objectives and goals.

The elements will be briefly described. Their individual goals and objectives will be outlined.

### 4.0 EVALUATION CRITERIA AND MEASURES

The next step in the process will be to gather information such that evaluation consistent with the objectives of this plan may be made. This information will be structured along the lines of the objectives and goals section of Figure 1.

#### 4.1 STUDY SELECTION

Based on the study selection criteria provided in the input section, information will be gathered based upon the following questions.

- How has the selection process operated?
- Are the criteria consistently applied with respect to insitutional objectives?

- To what extent are the criteria and selection process understood by both M.I.T./Cairo University participating faculty?

## 4.2 PROGRAM OBJECTIVES

For the three program objectives shown on Figure 1 the following structure will be used:

### 4.2.1 Mobilization of Academic Interest

- Do personnel trained under the project have continued opportunity to apply new skills?
- How well are follow-on studies designed and managed?
- Where an analytical model or other re-usable system or data has been established, is this being used as planned; is it being updated as required?
- Have new studies, or expansion of those started under the project been undertaken in the areas originally involved, in new areas?
- Is there expanded participation in the selection, management and review of studies and analysis; of what levels?

### 4.2.2 Organization of Technical Research in Collaboration with GOE Ministries

- Are the results of studies reviewed and applied in an objective and constructive manner to the problems at which they were directed?

- Are the results of studies applied to related areas where this is technically feasible?
- To what extent are these applications a result of initiative within the Ministry involved?
- At what levels of responsibility are findings being considered and applied?
- Are studies and analyses selected directly relevant to development problems and program needs?
- Have there been changes as a result of studies in the internal organization, or planning or management processes?
- What notable impacts have the projects had on government programs?
- Have any effects of improved programs been observed?

#### 4.2.3 Establishment of Institutional Framework

- To what extent have the procedures and policies of the Liaison Office contributed to the organizational framework of the Center?
- Has the experience of the applied research projects assisted in developing an operational model for the Center?
- Have the projects assisted in identifying resources to be utilized in the Center's operation?
- Has the Center been able to identify and utilize any linkages which have been established by the projects?

#### 4.3 PROGRAM GOAL

The information gathered in section 4.2 will provide the most significant insights into the progress toward attainment of the Program goals. Additional information will be sought to determine and document cases where the five elements have had a direct short term impact on the Program goals and evidence of feedback from Government Ministries which indicate progress or lack of progress in this area.

#### 5.0 OUTLINE OF EVALUATION REPORT

Upon completion of the information gathering and analysis the final report will be organized such that the findings will focus on:

- (a) The technical and nontechnical outcomes of the projects.
- (b) The development of the Center.
- (c) The development of Ministerial capabilities.
- (d) The development of Cairo University.
- (e) A general assessment of the overall Program performance and impact.

Additional recommendations will be made to improve implementation and/or impact of the overall Program.

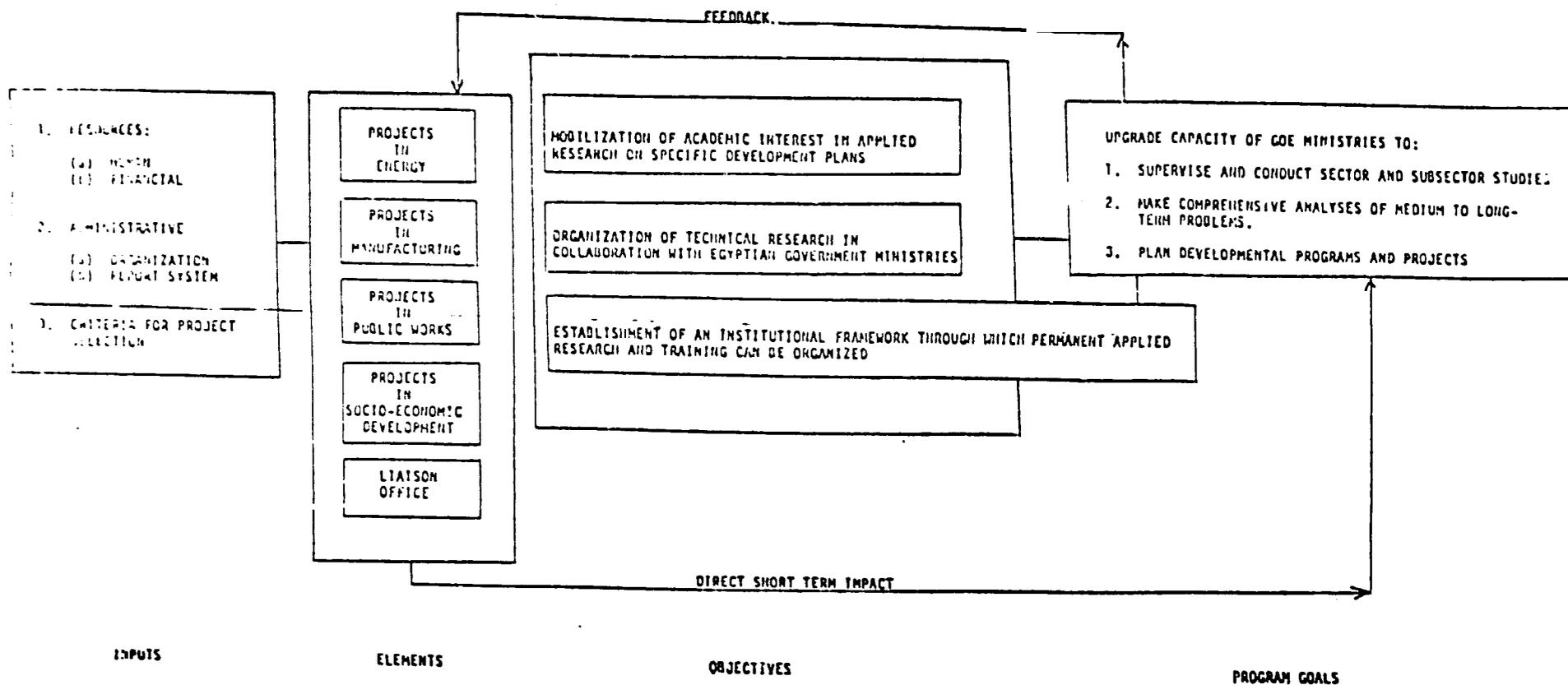


FIGURE 1. FLOW CHART FOR EVALUATION DESIGN

APPENDIX 3

MIT/CAIRO UNIVERSITY  
TECHNOLOGICAL PLANNING PROGRAM

<u>Project Title</u>	<u>M.I.T.</u>	<u>Cairo University</u>	<u>Ministry Supervisors</u>
1. Long-Term Investment Planning for the Egyptian Electric Power System	M. Weitzman/ J. Kirtley	M. Abou-Hussein	M. Abaza
2. Engineering Applications for the Plastics Industry	F. McGarry	S. Bayoumi	H. Amer
3. Housing and Construction Industry	N. J. Habraken	A. El Erian	M. El Hefnawy
4. Intercity Transportation Planning	F. Moavenzadeh	M. El Hawary	A. Daghestany
5. Urban Transportation	R. Gakenheimer	M. El Hawary	A. Daghestany
6. Regional Groundwater Studies	J. Wilson	A. Amer	K. Hefny
7. Stochastic Model of Nile Inflows to Lake Nasser	R. Bras/ P. Eagleson	I. Mobarek	H. Ibrahim
8. Water Resource Planning Models for the Nile River Basin	D. Marks	I. El Assiouti	S. Fahmy
9. Communication Needs for Rural Development	I. Pool	A. Aziz Kamal/ A. Dessouki	In process of being established
10. Egyptian Labor Migration	N. Choucri	A. Mohie El Din	H. Ismail/ A. Bindary
11. Health Care Delivery Systems	R. Eckaus/ L. Taylor J. Field	S. Shahbender	A. Mobarek
12. Improved Methods for Macroeconomic and Sectoral Planning	R. Eckaus/ L. Taylor	A. Mohie El Din	A. R. Abdel Meguid
13. Performance of Waxy Asphalt-Cements in Egyptian Road Construction	M. Baligh	A. M. Osman	In process or being established
14. Government Incentive for Small Scale Industry	S. Berger	M. El Said/ I. Fawzi	M. El Rafei

RESULTS\*EVALUATION OF THE TAP PROGRAM

## Part I: Academic Contributions to MIT

	SCALE	Yes 5	4	3	2	No 1
Is your research a continuation of prior work, rather than a new area of inquiry?	RESPONSES	1	7	3	5	3
Have you learned something <u>important</u> about adapting technologies for low income countries?		6	8	3	1	1
Has your work in Egypt generated new theoretical or conceptual insights?		2	2	9	3	3
Has your work in Egypt contributed to your teaching at MIT?		6	4	4	1.5	3.5
Is your research in Egypt important compared to your other research activities?		1.5	8	4	3	1.5

24 questionnaires were circulated; 19 were returned. Responses refer to the number of individuals in each entry. Fractional responses refer to the average of dual entries by a single respondent.

## Part II: Contributions to Egypt

A. Cairo University

	SCALE	Yes 5	4	3	2	No 1
Has your work acquainted your CU colleagues with new methods and approaches?	RESPONSES	11	6	2	0	0

How important are the following benefits to your CU colleagues?

	SCALE	Important 5	4	3	2	Unimportant 1
Ties established with the government	RESPONSES	7	6	4	0	1
Professional orientation		6	11	1	1	0
Professional competence		3	6	7	2	1
Improved work habits		1	5	5	1	6

Others: Ties with industry; status; money; travel; group work; self-sufficient attitude.

B. Government Ministries

	SCALE	Yes	4	3	2	No
		5				1
Has government personnel been involved in your research?	RESPONSES	3	3	4	8	1
Does the government appreciate certain problems more as a result of the research?		4	6	6	2	0
Has the research improved governmental ability to design and analyze projects?		2	4	5.5	3.5	2
Has government been willing to experiment with new research, administration or policy as suggested by research results?		4	1	5	4	3

### Part III: Project and Program Administration

#### A. The Research Context

	Positive			Negative	
	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
The inter-disciplinary nature of the research	5	6	6	2	0
The bi-national nature of the research	5	9	2	2	1
Availability and quality of the data	0	1	7	8	2
Having data analyzed in Cairo	0	4	7	4	2
Cooperation by GOE in making data available and establishing the necessary contacts	4	1	9	2	2
Effective working relations with CU counterparts	7	6	3	2	1
Coordinating and completing projects without continuous presence in Egypt for extended periods	1	5	5	6	1
Division of responsibility on undertaking the research	3.5	3.5	6	4	0

#### B. Administrative Context

The TAP organization at MIT	9	8	2	0	0
The Liaison Office in Cairo	11	6	2	0	0
The recruitment and identification of CU counterparts	8	4	5	1	1
Accommodation to CU administration and CU counterparts in their departments, schools, etc.	2	7	5	0	0
Coordination among individual projects under TAP auspices	1	4	4	4	1

C. Concerning Your Students at MIT

1. How many of your students at MIT have been involved in some aspect of your research in Egypt to date? 57+
2. How many have you funded from your TAP budget? 36-37
3. How many have you sent to Egypt in connection with your work there? 23
4. How many are now writing, or expect to write MS and PhD theses based on your Egypt project?  
MS: 15  
PhD: 12
5. How many additional students do you expect to be able to involve in your project over the next year or so? 23-28

D. Concerning Students at CU

1. How many have been involved in some aspect of the research to date? 87-102
2. How many are writing professional-quality papers, alone or with you and your CU colleagues, as part of the project? "several"
3. How many are now writing, or expect to write MS and PhD theses based on the project?  
MS: 18+  
PhD: 1
4. How many additional CU students do you expect to absorb into your project over the next year or so? 39-45+

## Part IV: Overall Evaluation of Program Structure

	SCALE	Satisfied			Dissatisfied	
		5	4	3	2	1
Intellectual substance of the work	RESPONSES	3	10	5	1	0
Working with CU counterparts		4	9	3	1	2
Working with GOE		1	5	7	3	1
Exposure to Egyptian conditions in terms of your professional development		7	9	3	0	0
Opportunities for your graduate students		7	3	3	1	2

Others:

Contribution to MIT educational process: 5  
 Time spent on diplomacy, etc.: 1  
 Time demands of project versus other commitments: 2  
 Travel, being abroad: 2

Finally,

	SCALE	Yes				No
		5	4	3	2	1
Do programs like this contribute enough to MIT to justify their continuation?		11.5	6	1.5	0	0
Should MIT encourage such projects as a contribution to others overseas?		16	3	0	0	0
Is your project important when weighed against alternative uses of your time?		2	11.5	3.5	2	0

## APPENDIX 5

### Summary Listing of Papers, Reports and Publications

#### I. Energy

##### A. Long-Term Investment Planning for the Egyptian Electric Power System.

(None)

#### II. Manufacturing

##### A. Engineering Applications for the Plastics Industry.

1. Bayoumi, S., M.A. El-Rifai and A.H. Gaber, "Preliminary Proposal for Standard Specifications for PVC Collapsible Blood and IV Solution Containers." Report No. 20, Engineering Applications for the Egyptian Plastics Industry (1979).
2. Ragab, A., M.A. El-Rifai and S. Bayoumi, "Current State of Egyptian Standards on Plastics." Report No. 22, Engineering Applications for the Egyptian Plastics Industry (1979).
3. Younan, M., A.M. Eleich, and S. Bayoumi, "Supplement to Report on the Testing of PVC Corrugated Pipes for Drainage." Report No. 17, Engineering Applications for the Egyptian Plastics Industry (1978).
4. Bayoumi, Said, Younan and El-Rifai, "Testing of PVC Pipes Produced Locally at Tanta." Report No. 21, Engineering Applications for the Egyptian Plastics Industry (1979).
5. Bayoumi, S., and M. Younan, "Proposal for Fracture Mechanics Analysis of PVC Pipes." Report No. 18, Engineering Applications for the Egyptian Plastics Industry (1979).
6. El-Zoghby, M. Younan and Eleich, "Status Report on Fracture Mechanics Studies of PVC Pipes at CU". Report No. 23, Engineering Applications for the Egyptian Plastics Industry (1979).
7. Roberts, D., "Study of the Fracture of HDPE Gas Distribution Pipe." Report No. 26, Engineering Applications for the Egyptian Plastics Industry (1979).
8. Darwish A., "Evaluation of Fracture Toughness of PVC Pipes". Report No. 27, Engineering Applications for the Egyptian Plastics Industry (1979).
9. Bayoumi, and Younan, M., "Design of a PVC Testing Extruder According to ASTM". Report No. 25, Engineering Applications for the Egyptian Plastics Industry (1979).

10. Eleich, A., and A. Ragab. "Design of a Specimen Moulding Set up According to ASTM". Report No. 24, Engineering Applications for the Egyptian Plastics Industry (1978).

### III. Public Works

#### A. Housing and Construction Industry

1. "The Housing and Construction Industry in Egypt," Interim Report Working Papers 1978. Prepared by the Joint Research Team on Housing. Publicly available May 1979.
2. "Summary Report 1978: The Housing and Construction Industry in Egypt." Prepared by the Joint Research Team on Housing. Publicly available May 1979.
3. "Proceedings, Seminar on Core Housing and Site and Services Projects for the Low Income". Co-sponsored by the CU/MIT project, and the Ministry of Housing and Ministry of Development and New Communities. Publicly available May 1979.

#### B. Intercity Transportation Planning

##### Reports

1. Moavenzadeh, F., M. El-Hawary, M.J. Markow, M. Owais, and B. Brademeyer, Road Transport Analysis in Egypt. TAP Report 78-6 (Fall 1978).
2. Brademeyer, Brian D., Framework for Unimodal Model Development. (January, 1979).

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1. Moavenzadeh, F., B. Brademeyer, M.J. Markow, M. El-Hawary, and M. Owais, Road Network Analysis in Egypt. Presented at the Second International Conference on Low-Volume Roads, Ames, Iowa (August 1979).
2. Gadallah, Ahmed Atef and Brian Brademeyer, Modification of AASHTO Model for Road Deterioration in Egypt. To be presented at the Annual Meeting, Transportation Research Board (January 1980).

##### Working Papers

1. Friesz, Terry L. and J.E. Fernandez-Larranaga, Design of a Multimodal, Intercity Transportation Planning Model: 1. The Equilibration Methodology (January 1979).
2. Jara-Diaz, Sergio R., Trip Generation at a Regional Level: A Review. (January 1979).
3. Brademeyer, Brian D., Framework for Unimodal Model Development. (January 1979).

4. Turreilles, Francisco A., Transportation Market and Operating Regulations and Their Effect on the Multimodal Transport Project Effort. (March 1979).
5. Safwat, K. Nabil Ali, Intercity Transportation Project of Egypt: Phase I: Policy Study, Regulation theories and practices in the U.S. and its relevance to Egypt. (January 1979).
6. Bary, Dr. Farouk Abdel, Description of the Transport Network. (November 1978).
7. Gadallah, Dr. Atef, Traffic Levels and Projections. (November 1978).
8. Owais, Dr. Mohammed, Transport Costs. (November 1978).
9. Ousy, Mr., Tariff Structure. (November 1978).
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C. Urban Transportation

1. Gakenheimer, R., Urban Transportation Project: Relating Short-Term Options to Long-Range Consequences in the Greater Cairo Metropolitan Area, Draft, January 28, 1977.
2. Gakenheimer, R. and Brigham T., Urban Transportation Project: Relating to Short-Term Options to Long-Range Consequences in the Greater Cairo Metropolitan Area, March 3, 1977.
3. El-Salamawy, A., Transport Planning in Greater Cairo, as Means of Influencing Development, June 6, 1977.
4. Michael, Martin, Notes on Meeting with the Mohamed Salah El Haldair, NASR Automotive Manufacturing Company, June 1977.
5. Brigham, T., Abraham Enhancements DA33 and DA34, Memo, c. June, 1977.
6. Gakenheimer, R., Memorandum: Interview with Mr. Ismail Kamel, July 18, 1977.
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8. Gakenheimer, Ralph, T. Brigham, M. Michael, Programming/Implementation: Brief Statement, August 1, 1977.
9. Gakenheimer, Ralph, et. al., Progress Report, 3/15/77 to 9/1/77, August 28, 1977.
10. Sharma, Atal, Auto Ownership, Summer 1977.
11. Sharma, Atal, Policy Frame for Private Auto Ownership, Summer 1977.

12. Michael, Martin, Notes for Project Review Paper, Summer 1977.
13. Keller, D., Programming: Possibilities and Problems, Draft, September 6, 1977.
14. Keller, D., Uncertainty: An Attempt to Structure the Issue, Draft, September 6, 1977.
15. Gakenheimer, Ralph, Mohamed El Hawary, and Martin Michael, The Transportation Project Development Process in Cairo, Draft, September 1977.
16. Keller, D., Programming: A Proposal, September 1977.
17. El Hawary, M. and M. Owais, Traffic Speed/Delay Characteristics in Cairo, Paper, undated, c. September 1977.
18. Keller, Donald, Discussion Paper: Programming Options, October 5, 1977.
19. Keller, Donald, The Budget Estimation Problem, October 6, 1977.
20. Keller, Donald, Prototype Procedure, November 19, 1977.
21. Gakenheimer, Ralph, M. El Hawary, and M. Michael, Urban Transportation Project Development and Implementation in Cairo, Egypt, Appendix I, The State of Urban Transportation Projects, November, 1977.
22. Cairo Urban Transportation Project, Proposal for Three-Year Extension of the Research, December 7, 1977.
23. El-Hawary, M., R. Gakenheimer, et. al., The Research Group of the Greater Cairo Urban Transportation Project, Interim Report, December 13, 1977.
24. Shawaly, El-Sayed, Speed and Volume Characteristics on Urban Street Network of Cairo Metropolitan Area, Thesis, 1977.
25. Keller, D., Programming: Prototype Procedure (Second Draft), March 19, 1978.
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27. Brigham, T., Memorandum: Cairo Transit Survey, March 24, 1978.
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29. El Hawary, Mohamed, et. al., Appendix 3, Instructions for filling the interview form on board of the different public transport modes (except the urban railway lines), March 1978.
30. El-Hawary, Mohamed, et.al., Urban Transportation Project: Ross Transit, April 1978.

31. Keller, Donald, Demographic and Economic Data Requirements for the Prototype Procedure, Spring 1978.
32. Noureldin, Magdy, Farouk Abd El Barry, and Hamdy Ismail, A Research Proposal on a Parking Demand Model for Cairo CBD Area, Paper, May 1978.
33. Gakenheimer, Ralph, El-Hawary, and M. Michael, Transportation Project Development and Implementation in Cairo, Egypt, Paper, August 1977, Revised May 1978.
34. Brigham, T., Memorandum: Summer-Fall Preliminary Schedule, June 26, 1978.
35. El-Hawary, Mohamed, et. al., Data Processing of Public Transport Old Surveys, June 1978.
36. El Sherif, M. Hesham, LCCC: Computer Aided Technique for Life Cycle Cost Calculation/Analysis During Systems Contracting, received, June 1978.
37. Gakenheimer, Ralph, Urban Transportation: Issues in Cairo (Conference Paper), June 1978.
38. Hardman, Anna, Notes on Meeting with General Helmy Badran, Cairo Traffic Police, July 1978.
39. Lerman, Steven, A Model of Parking Behavior in Downtown Cairo, July 1978.
40. Shishido, Hisanobu, General Framework of Auto Ownership Study, July 1978.
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42. Hardman, Anna, Parking in Cities: A Bibliography, August 1978.
43. Hardman, Anna, Egypt: Population and Economy, A Working Bibliography of Sources, Draft, August, 1978.
44. Michael, Martin, Notes on Cairo Transit Authority, August 1978.
45. Michael, Martin, An Interorganizational Analysis of Urban Transportation Project Development in Cairo, Egypt, MCP Thesis, MIT, August 1978.
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47. Keller, Donald, Requirement of Cost Specification, Summer 1978.

48. El Reedy, Tarek, Traffic Mobilization in Cairo, undated, c. October 1978.
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51. Brigham, T., Preliminary Thoughts on Analysis of Public Transportation Data, Memo, November 16, 1978.
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53. Lerman, S., Parking Policy Study, Memo, November 29, 1978.
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55. El-Hawary and El-Hawary, Urban Traffic Pattern in 'Greater Cairo' Position Paper, November, 1978.
56. El-Hawary and El-Gawary, Trip Generation Rates, Position Paper, November 1978.
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58. El-Reedy, T., The ICL Traffic Assignment Package, Progress Report, November 1978.
59. Glaly, Nashaat., Car Ownership, Paper, November 1978.
60. Hardman, Anna, Public Transportation in Cairo: summary of Issues and Available Resources, November 1978.
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63. Keller, Donald, Memorandum: Analysis Program, December 1, 1978.
64. Keller, Donald, Estimating the Pace of Implementation: Guidelines and Worksheets, December 20, 1978.
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66. Hassau, Mokhtar, Coding of the Street Network in Cairo to Apply Assignment Model, Memo, December, 1978.
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68. El-Sherif, Hisham, Operating UTPS in Egypt, Memo, January 7, 1979.

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70. Nouredin, M. and H. Khaled, The Parking Study, Memo, January, 1979.
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72. Keller, D., Travel Demand in Cairo: Projections with the Matrix-Factor-Method, February, 1979.
73. Keller, D., Some Observations on the Private Vehicular Trip Rates in Cairo, Paper, February, 1979.
74. Shishido, H., Memo on Improvement of Auto Ownership Model and Study of Returning Migrants' Impact on the Supply of Cars, February 22, 1979.
75. Hardman, Anna, Local Government Role in Transportation Planning in Egypt: Notes on Discussion with Eng. Salamawy, February 1979.
76. Shishido, H., Memorandum on Linear Programming Model of Estimating Auto Ownership, March 29, 1979.
77. Keller, Donald, Value Information File, March 1979.

#### D. Water Resource Planning

##### Regional Groundwater Studies

1. Hashish, M.A.M., Rasmy, M.E.M. and Amer, A., "One Dimensional Steady State Sea Water Intrusion in Coastal Leaky Aquifers I - Analytical Treatment," Working Paper No. 1, Regional Groundwater Studies in Egypt, Nile Delta Study, Cairo, September 1978.
2. Rasmy, M.E.M., Hashish, M.A.M. and Amer, A., "One Dimensional Steady State Sea Water Intrusion in Coastal Leaky Aquifers II - Assessment of the Linerization," Working Paper No. 2, Regional Groundwater Studies in Egypt, Nile Delta Study, Cairo, December 1978.

##### Stochastic Models of Nile Inflows to Lake Nasser

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2. Mobarek, I.E., M.H. Salem, and H.T. Dorrah, Stochastic Modeling of Nile Inflows to Lake Nasser, Research Report, C.U./M.I.T., Technological Planning Program, December 1977.
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4. Curry, K. and R.L. Bras, Theory and Applications of the Multi-variate Broken Line, Disaggregation and Monthly Autoregressive Streamflow Generators to the Nile River, TAP Report 78-5, September 1978.
5. Bras, R.L. and J.R. Cordova, Introductory Notes on Operational Hydrology, Workshop on the Elements of Water Resource Systems Analysis and Planning, June 11-22, 1978, Cairo University-MIT, Technological Planning Program.
6. Eagleson, P.S., Introductory Notes on Operational Hydrology, Workshop on the Elements of Water Resource Systems Analysis and Planning, June 11-22, 1978, Cairo University/MIT, Technological Planning Program.
7. Curry, K. and R.L. Bras, Practical Aspects of the Multivariate Broken Line Streamflow Generator, presented at the A.S.C.E. Water Resources Planning and Management Division Specialty Conference, Houston, Texas, February 1979.

#### Water Resource Planning Models for the Nile River Basin

1. A Guide for the Use of the MIT River Basin Simulation Model, K.M. Strzepek, R.L. Lenton and David H. Marks, TAP Report 78-2, November 1978.
2. An Irrigation Planning Model for the Nile Delta, F. Ramos and D.H. Marks, TAP Working Paper, October 1978.
3. "Multi-Level Planning for Irrigation and Drainage in the Nile River Valley", K.M. Strzepek, F. Ramos and D.H. Marks, ASCE Conference "Water Systems 79", February 1979.

#### IV. Socio-Economic Development

##### A. Communication Needs for Rural Development

The first written products are due Summer 1979.

##### B. Egyptian Labor Migration

1. Choucrist, Nazli, Richard Eckaus, Amr Mohie-Eldine, Migration and Employment in the Construction Sector: Critical Factors in Egyptian Development, Technology Adaptation Program, October 1979.
2. Eckaus, Richard S., "The Effects of Construction Labor Migration on the Egyptian Economy" Revised, July 10, 1979.
3. Kriger, Norma, "A Comparative Description of Population Policies: North Africa and the Middle East", Technology Adaptation Program, January 1979.

4. Van Wicklin, Warren A., III, "Manpower Planning Models: Theory and Practice", Technology Adaptation Program, March 1979.
5. Choucri, Nazli, Labor Transfers in the Arab World: Growing Interdependence, 1979.
6. Choucri, Nazli, Demographic Changes in the Middle East: New Factors in Regional Politics, February 1979.

C. Health Care Delivery Systems

1. Field, John Osgood and George Ropes, "Development in the Egyptian Governorates: A Modified Physical Quality of Life Index," L'Egypte Contemporaine (May 1979).
2. Weighing Exercise Data Digests
3. Memorandum: "Thoughts on the Weighing Exercise"
4. "Nutrition, Malnutrition, and Disease" paper.
5. Taylor, Lance, "Food Subsidies in Egypt", October 1979.

D. Improved Methods for Macroeconomic and Sectoral Planning

1. "Economic Effects of the Migration of Egyptian Construction Labor".
2. Eckaus, Richard S., F. Desmond McCarthy, and Amr Mohie-Eldin, "Multisector General Equilibrium Models for Egypt", Report No. 233, March 15, 1979 (working paper).
3. Eckaus, Richard S., "An Overview of Real Economic Development in the Middle East Since, 1973", February 20, 1979.

APPENDIX 6

PERSONNEL POLICIES AND PROCEDURES:

A Manual for Personnel Administration

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CAIRO UNIVERSITY/M. I. T.  
Technological Planning Program  
Liaison Office

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### Personnel Policies and Procedures; A Manual for Personnel Administration in the CU/MIT Technological Planning Program

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1.0

Employment Policy

The main objective of the CU/MIT Technological Planning Program is to assist Cairo University in developing the capabilities to contribute to the formulation and implementation of science and technology policies in Egypt. The program is funded through USAID and is expected to continue through August 1983. Details of specific aspects of the program can be found in the various reports available in the Liaison Office.

The Program is administered at M.I.T. under the guidance of the Technology Adaptation Program (TAP) and at Cairo University under the direction of the Executive Committee of the Technological Planning Program (TPP), and the Vice Rector for Research on Graduate Studies.

The M.I.T. Liaison Office in Cairo includes an M.I.T. Liaison Officer, Mr. George Petievich, and a core staff of Egyptian employees under the direction of General A. Mamdouh Hassan, Administrative Officer. Additionally, a certain number of hourly, or casual and/or contract employees are employed by the Program.

The Liaison Office in Cairo is responsible for

- a) Liaison with the M.I.T. and Cairo University Executive Committees, with the research project faculty and staff from M.I.T., Cairo University and the various Ministries, with USAID, and with the M.I.T. Comptroller's Office and the M.I.T. Office of Sponsored Programs.
- b) Administrative operations in Cairo, including communications, purchasing, travel and transportation arrangements, government regulations, management of facilities, etc.
- c) Accounting operations in Cairo, under the guidance of M.I.T.'s Comptrollers Accounting Office, for check registers, local disbursements, account summaries, banking, reconciliations, travel advances, expenditures, etc.
- d) Centralized secretarial services for the Cairo University Executive Committee, M.I.T. visitors, Administrative Liaison Office, and CU Projects; including typing, translating, editing, photo-copying and printing; and distribution of project and administrative correspondence, proposals and reports.

The purpose of this manual is to provide Egyptian employees with the overall policies and procedures affecting their employment with the CU/MIT program. The CU/MIT conditions of employment are regulated by Egyptian Labor Law Number 91, promulgated by the Ministry of Labor.

## 2.0 Hiring and Termination Policy

### 2.1 General Responsibility for Hiring

Hiring authority for the CU/MIT Program Egyptian staff rests with the Executive Committee of the Technological Planning Program (TPP) and the Vice Rector for Research on Graduate Studies. The Executive Committee will act on recommendations made to them by the Administrative Officer, with the advice and counsel of the M.I.T. Liaison Officer and the Director of the M.I.T. Technology Adaptation Program (TAP). Specific salary rates are subject to approval by the Director, MIT TAP.

### 2.2 Definition of Employment Categories

Liaison Office Staff The majority of the Egyptian staff in the program will be regular, full time employees, employed for a specific period of time as outlined in an appointment letter. The conditions of employment described in this manual will apply to all regularly appointed Liaison Office Employees.

Hourly Employees In accordance with Egyptian Law, the office will also employ from time to time, or on a part-time basis, a small number of contract drivers and other temporary staff during peak periods of work. These employees will be paid on an hourly or contract basis and will not be considered Liaison Office staff for the purposes of this manual.

### 2.3 Establishment of Rate of Pay

Pay rates will be established by the TPP Executive Committee as recommended by the Administrative Officer with the guidance of the M.I.T. Liaison Officer. Rates of pay will be competitive with the local market for international, short-term enterprises. Salary rates for any position are subject to the approval of the Director, MIT TAP.

A salary survey was conducted in May 1978 to determine proper salary ranges for existing staff and to recommend increases for staff completing one year's service. A survey will be conducted annually throughout the course of the program to assure equity and proper compensation levels for Egyptian employees.

The pay rate for hourly employees will be set by the Administrative Officer after comparison with local compensation levels for type of work performed. No annual bonus is paid to employees by the CU/MIT Program.

### 2.4 Offer and Letter of Appointment

Each regular Liaison Office staff member will receive a letter of appointment confirming his or her appointment of employment,

the rate of pay, conditions of employment, and job duties. This letter of appointment will be approved by the Director of the TPP Executive Committee, the Director of the TAP, and the Vice President of Higher Education and Research of Cairo University. The Liaison Office staff member will signify acceptance of the appointment and its terms by signing the appointment document and returning it to the Administrative Officer.

2.5 Pre-employment Medical Examination

All regular Liaison Office staff employees will be required to pass a pre-employment medical examination as a condition of employment. The cost of this examination will be borne by the program. At the discretion of the Administrative Officer, certain hourly paid employees may also be required to pass a pre-employment medical examination.

2.6 Probationary Period

All regular employees will be on probation for 90 days, during which period it will be determined whether the employee should continue through the term of the appointment contract outlined in the appointment letter. At the expiration of the 90 day probationary period, a discussion should occur with the employee concerning performance, expectation, continuance, duties and related matters.

2.7 Notice of Termination or Resignation

During the probationary period, an employee may be terminated, or an employee may resign, with two weeks' notice.

At the completion of the probationary period, it is expected that at least one month's notice will be given by any employee who wishes to resign. In fairness, an employee cannot be terminated, except for a serious offense, unless he or she has been warned and given an opportunity to correct any deficiencies in performance. A warning states what the deficiency is, how to correct it, and what will happen if it is not corrected.

3.0 Working Conditions

3.1 Hours of Work

The work week specified at the CU/MIT Liaison Office is six (6) days per week 8 AM-2 PM from Saturday through Thursday. From time to time, at the discretion of the Administrative Officer, in consultation with the M.I.T. Liaison Officer, the office may adjust its normal six day work week pattern to a five (5) day work week. This adjustment may be made during periods of reduced visitor or conference activity, for example, with the express purpose of providing compensatory time off (in lieu of overtime payments) for other periods

when activity requires longer days, or a seven day work week. (See Section 5.2 for pay policy).

3.2 Attendance and Punctuality

Dependable attendance and a responsible attitude toward work are expected of a Liaison Office Staff employee. Unusual circumstances which affect an employee's reliability or attendance, such as illness, family difficulties, or dissatisfaction with assigned duties, should be discussed with the Administrative Officer. (See Sec. 8.102 for policy).

3.3 Reporting of Time Worked, Holidays, Vacation and Sick Leave

Accurate reporting of attendance and time worked is important in administering pay policies. The Administrative Officer is responsible for making accurate and complete reports of employees' time worked, paid leave and unpaid absences. To maintain good standards of attendance, the Administrative Officer will require all employees to obtain permission in advance for absences, both paid and unpaid. The limits for each kind of paid leave (vacation, sick leave) and unpaid leave will be observed and employees will be responsible for verifying absences or providing a doctor's certificate when appropriate in the case of sick leave. (See Sec. 8.101 for policy).

A complete record of hours worked, including overtime payments (or hours accrued for use as compensatory time at a later date), will be maintained by the Administrative Officer.

3.4 Discipline and Grievance Procedure

The Administrative Officer, or immediate supervisor, in consultation with the Administrative Officer, will decide if an employee's work or conduct is unsatisfactory and what steps should be taken.

Any employee who believes that he or she has been treated unfairly should have access to a clear means of seeking redress. It is hoped that any person who feels aggrieved will have sought to resolve his or her complaint; an employee may petition the Administrative Officer, or if more appropriate, the Executive Committee to hear and resolve his or her complaint.

#### 4.0 Vacation and Leave Policies

##### 4.1 Recognized Holidays

Certain holidays are observed each year as days of paid rest for Liaison Office Staff employees. The holidays to be granted each year will be issued by the Administrative Officer prior to 1 January of the year in question.

These holidays will normally follow the official Egyptian government holidays as adjusted for necessary considerations in dealing with the USAID mission and visiting M.I.T. personnel. Only necessary work, as determined by the Administrative Officer, is performed on a holiday. An employee required to work on a holiday will be paid at a premium rate equal to twice his normal salary (double time pay), or be granted compensatory time off at a later date.

##### 4.2 Vacation Period and Scheduling

Vacation scheduling will be made in view of the work requirements of the Liaison Office, following the preference of the employee as far as these work requirements permit. Vacations are normally taken during periods of limited numbers of visitors to the Liaison Office. The Administrative Officer will request each employee to indicate his or her preferences for vacation and draw up a vacation schedule to assure continuous operation of the Liaison Office. (See sec. 8.101 for policy).

Vacation not used each year will be lost unless the Administrative Officer makes special arrangements for vacation carry-over. In no case will vacation beyond 1 year's accrual be carried over into the next year.

##### 4.3 Sick Leave and Personal Leave

July 1 of the year starts a new sick leave year. Each employee is credited with 12 days of sick leave as allowance for the coming year. In addition, unused sick leave from previous years may be carried forward up to a maximum accrual of 60 days. A new employee receives a sick leave allowance in his first year that is prorated at one day per month.

To be entitled to paid sick leave an employee should notify the Liaison Office, if at all possible, on the first day of absence. In a prolonged illness the employee should keep the Administrative Officer informed of his or her progress. The Administrative Officer, at his discretion, may require the employee to present a certificate of illness from his or her doctor before sick leave is paid.

In certain cases, to be determined by the Administrative Officer and the Executive Committee, sick leave pay at 75% salary will be continued for 90 days, 85% of salary for the next 90 days after the expiration of accumulated sick leave. As well, any chronic or serious illness will be treated on an individual basis in accordance with Egyptian law.

At the discretion of the Administrative Officer, employees may be granted up to 3 days personal leave each year, to be deducted from their sick leave balances. (See section 8.101 for policy).

#### 4.4 Other Leave

Other leaves to be granted, such as maternity leave, military leave etc., will be determined in accordance with Egyptian law.

### 5.0 Pay Policies

#### 5.1 Pay Period, payroll reports

Salary payments to CU/MIT employees are made from a foreign government fund (USAID) and therefore are not subject to Egyptian income tax. The program also pays both the employer and employee share of social insurance. Thus, the monthly salary quoted in the appointment letter is net pay to the employee, paid monthly at the end of the month.

The Administrative Officer is responsible for obtaining monthly reports on hours worked (including overtime, sick leave, vacation, and other leave) from each employee. This responsibility may be delegated to the Accounting Officer, if appropriate.

#### 5.2 Overtime Payment

All regular employees of the Liaison Office are eligible for overtime payment for hours worked beyond the normal specified 6 day work week of 8 AM-2 PM.

Any overtime work requires the specific, prior authorization of the immediate supervisor and / or the Administrative Officer. Work loads should be structured so that the use of overtime is required only occasionally, if at all. Overtime should be used sparingly and only when necessary.

Payment for overtime hours worked should be calculated at time and one quarter the normal hourly pay rate.

The Administrative Officer is responsible for the proper recording of overtime hours and for assuring that the correct compensation is paid to the employee. Again, as the normal payroll process, this responsibility may be delegated to the Accounting Officer.

At the discretion of the supervisor and / or the Administrative Officer, and in consultation with the employee, compensatory time off may be used in lieu of overtime payments. This would permit the office staff to be efficiently utilized during the peak periods of Liaison Office activity and permit employees time of during slack periods.

The proper recording of compensatory time, in lieu of overtime payments, is the responsibility of the Administrative Officer, although this may be delegated to the Accounting Officer.

### 5.3 Annual Review Procedures

Each employee who has completed his or her probationary period will be reviewed for performance annually prior to July 1. This review will be conducted by the immediate supervisor and / or the Administrative Officer. The review will include a discussion between the supervisor and employee about the job, the employee's performance and any other significant aspect of the work situation important to either the supervisor or the employee.

Salary increases will be based on competitive survey as well as on the performance evaluation of the employee.

## 6.0 Benefits

### 6.1 Social Insurance

Social insurance, amounting to 31.5% of gross salary will be paid by the program for each regular employee. This will include:

25% for old age, disability and death.

1.5% for savings.

5% for injury insurance and unemployment insurance.

As mentioned in Section 5.1, the rate of pay quoted in the letter of appointment is net pay and does not reflect deductions made for social insurance, which are paid entirely by the Program.

### 6.2 Other Benefits

Other benefits to employees, such as other medical coverage, etc., will be the responsibility of the Administrative Officer to research and recommend to the Executive Committee for approval, if found warranted.

7.0 Position Descriptions

Each employee of the Liaison Office will have a written job description, outlining his or her major duties and responsibilities. These position descriptions will be reviewed and updated at the time of the annual review, or any other time that significant changes to the job duties occur.

Policy and Procedures

## 8.101

I. Scope

This policy applies to all CU/MIT employees who hold appointments.

II. Applicability

This policy should be uniformly applied to all covered employees, regardless of rank or status. Any exceptions to the procedures described herein will be subject to prior specific written approval with the approval countersigned by both Gen. Mamdouh and Mr. Petievich.

III. Policy

It is the policy of the CU/MIT office to grant leaves of absence to all employees in accordance with Egyptian law, custom and the requirements of the program.

IV. Procedure

1. An employee planning an absence from the office during scheduled working hours will make the necessary arrangements with Gen. Mamdouh two working days in advance of the first planned day of absence.
2. Having made satisfactory arrangements with Gen. Mamdouh, the employee will inform Mr. Hassan Meguid, so that the proper entries may be made in the attendance records and any necessary accounting transactions may be completed.
3. Any work that would normally be done by the absent employee will be provided for. This means transferring the tasks to an appropriate delegate, so that the work may be completed in a timely and effective fashion during the employee's absence.

V. Discussion

This policy provides for four types of leave of absence:

1. Annual leave (also referred to as vacation, holiday, or usual leave), which is discretionary time away from work for the convenience of the employee.
2. Sick leave, which governs situations where the employee, by reason of physical disability is unable to fulfill the obligations of the position.
3. Casual leave, which is a short-term absence for the

convenience or benefit of the employee.

4. Unpaid leave, which is an absence from assigned duties; during such absence, no compensation nor other benefits shall accrue to the employee.

A. Annual (usual) Leave

- (i) Thirty days of paid annual leave shall be available to any employee who has completed ten years of service or is more than fifty years of age.
- (ii) Twenty-one days of paid annual leave shall be available to any employee who has completed more than one year of satisfactory service.
- (iii) Fifteen days of paid annual leave shall be available to any employee who has completed more than ninety-one days of service, but who has completed less than twelve full months of service.

- (a) In case of a genuine emergency of a personal nature, an extension of an approved leave may be granted if an employee:

is entitled to additional days, and notifies the office not less than forty-eight hours prior to the end of the scheduled absence, and

the extension does not amount to more than a week.

Note:

All of these conditions must be met in order for the employee to be paid while absent.

- (b) For purposes of computing the utilization of annual leave, all days during absence will be counted including Fridays, Saturdays, official holidays and other times the office is not open for business.

B. Sick Leave

It should be noted that sick leave is an employee benefit intended to protect the interest and welfare of the employee when unable to attend assigned duties by reason of physical disability. An employee who has been absent on sick leave must report in person to the

8.101B (cont.)

office before undertaking leave of another classification.

Sick leave falls into four broad categories:

- (i) One month full pay
- (ii) Three months at three-quarters (75%) of regular pay.

8.102 POLICY and PROCEDURE NUMBER 102

I. Scope

This policy and procedure is applicable to all CU/MIT employees who are compensated in any manner for their services.

II. Applicability

This policy shall be applied to all employees, as directed by General Mamdouh, Mr. George Petievich, or their duly appointed delegates.

III. Effectivity

This policy and procedure will be effective from September 1, 1978 until revised or revoked in writing.

IV. Policy

It is the policy of the CU/MIT office to act as an effective service organization in support of the joint objectives of Cairo University and Massachusetts Institute of Technology, as embodied in the stated goals of the CU/MIT Technological Planning Program. This implies a stable, efficient, effective and dependable work force, which can be relied on to be at their assigned duty stations on a predictable and punctual basis.

V. Procedure

1. All employees will report punctually to their assignments; ready, willing and able to execute their assigned duties in a cheerful and effective fashion.
2. Employees may be required to report for duty at any time or place as determined by the needs of the program; as defined and interpreted by Gen. Mamdouh and Mr. Petievich, or their duly designated representative.
3. An employee, once assigned to a task, is expected to complete the assignment before abandoning it or diverting efforts to some alternative.
4. Employees demonstrating deficiency in punctuality or attendance will be dealt with in accordance with the provisions of the governing and applicable Egyptian Labor Law.

VI. Discussion

1. Normal office hours are 08:00 - 14:00, Saturday through Thursday. It is recognized that certain tasks, by virtue of their nature, must be attended at other time as dictated by necessity or imposed by program requirements.
2. Tardiness in excess of fifteen minutes is not normally acceptable.
3. More than two such incidents of tardiness in any given thirty day period is considered cause for concern, and is ground for serious discussion between the tardy employee and that employee's supervisor.
4. Excessive tardiness (see section 3, above) will be subject to consideration in the light of the applicable sections of the Egyptian Labor Laws.

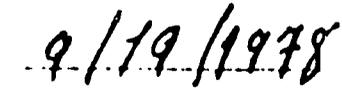
A. Special Schedules

- (i) At the end of a designated workday, it is expected that employees will check with their supervisors for special assignments before leaving.
- (ii) For activity outside of designated working hours, overtime pay will be subject to approval by the employee's supervisor, without exception.
- (iii) If, in the judgement of an employee's supervisor, program requirements dictate the extension or modification of an employee's work schedule, this may be implemented without prior arrangement. Such alterations of normal work schedules shall be subject to compensation at premium rates or compensatory time off work, at the sole discretion of the employee's supervisor.

PREPARED BY:



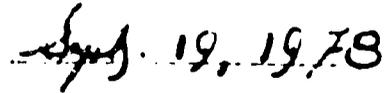
Gen. A. Mamdouh Hassan



Date



George N. Petioevich  
x



Date

Revised Jan. 3, 1979

## APPENDIX

### CAIRO UNIVERSITY CENTER OF RESEARCH ON DEVELOPMENT AND TECHNICAL PLANNING (CRDTP)

#### Article 1 :

A center for research on development and technological planning will be initiated in Cairo University.

The main objective of the center is to develop and support research studies, training programs and consultation which help achieve the development goals of Egypt. In due time, the center will involve to take the form of a development and technological planning institute which may offer academic degrees in addition to performing the above mentioned objective in such a way to maximize the utilization of the academic resources of Cairo University.

#### Article 2 :

This center is considered as a unit of autonomous nature as described in article 196 of the law 49, year 1972 for university regulations. The center has its own technical, financial and administrative entity according to articles 307-314 of the university bilaws.

#### Article 3:

The center will engage in the following activities:

- a) to provide a technical research basis, help training Egyptian government cadres involved in planning and implementation of development projects.

- b) to improve academic resources in Egypt in order to apply research for the analysis and solution of development problems.
- c) to create a permanent framework, through which to direct applied research and training capacity towards solving development problems and technology adaptation for development purposes in Egypt.
- d) to provide methods for analysing programs of economic, social and technical development with the help of associated institutions.
- e) to provide technical consultation to the Egyptian Government ministries in identifying and modeling development problems and device applicable solution programs.
- f) to train Egyptian at the associate foreign institutes:
- g) to organise conferences, symposiums and meetings, as consistent with the above objectives.

Article 4:

The center will be directed by a board of directors appointed by Cairo University Rector for a period of two years that can be renewed. The board will be composed as follows :

- a) Cairo University Rector ( chairman).
- b) Director of the center
- c) 2 senior participating, faculty members of Cairo University.
- d) 2 senior academic administrators (dean/deputy dean/department head) from Cairo University.

- e) 3 Ministry members including Ministry of Planning to be appointed by the Rector of Cairo University for a period of two years upon recommendation from the board of directors.
- f) possibly up to two members from foreign academic institutions may be appointed by the board of directors for a period of two years.

The Board of Directors may invite representatives of other foreign cooperating institutions to attend its meetings as non-voting members.

Article 5 :

The Board of Directors is the principal authority of the Center and may make any decisions to realize its goals within the regulations of the center, namely to :

- a) Determine policy outlines for the Center.
- b) Approve the plans which the Center will follow to achieve its objectives.
- c) Issue administrative, financial and technical statutes of the Center upon the recommendation of its Director.
- d) Review and approve on the annual draft budget for the Center and the projects.
- e) Review regular reports of the Center's progress.
- f) Identify and select activity proposals in the areas of interest to the Center and government ministries and agencies.
- g) Authorize the Director to sign agreements or contracts with persons, establishments, companies and organizations in order to carry out project development activities.
- h) The Board of Directors may delegate prerogatives to the Chairman and/or the Director.

## Article 5

The director of the Center, who is appointed by the Rector of Cairo University for a period of two years, that can be renewed, is responsible for the Center's operation and administration. The Director assumes the delegated powers of the statutes, and in particular carries out the following tasks:

- a) Implements the resolutions of the Board of Directors.
- b) Proposes the Center's plan of activities to be reviewed and approved by the Board.
- c) Prepares the Center's budget and its balance sheet and submits it to the Board of Directors.
- d) Supervises the activities of the Center, and develops new areas of activity to achieve its objectives.
- e) Administers day to day operations and ensures effective cooperation with government, outside clients, and Cairo University.
- f) Represents the Center in its relations with organizations, individuals or specialized agencies.
- g) Implements the general policies and plans approved by the Board of Directors and submits reports to them on the progress of the implementation.
- h) Proposes new research areas and training programs for the Center and submits them to the Board of Directors for deliberation and approval.
- i) Signs agreements or contracts which have been reviewed and authorized by the Board of Directors.

- j) Proposes the Center's organization structure, its statutes and procedures of operations and submits them to the Board for approval.

Article 7 :

The Board shall meet at least once monthly. The Chairman may also convene additional meetings, provided invitations are sent 3 days before the meeting, with the agendas and copies of memos on the subjects to be submitted to the Board. Meetings will not be valid if not attended by the majority, otherwise the Chairman may fix another date and report it to all members, when the meeting will be valid with whatever attendance.

Reports of meetings will be written in a separate register.

In case of absence of the Chairman the meeting will be presided by the senior academic member present.

Article 8 :

Board decisions are issued by majority vote of attending members. In case of equal votes, the Chairman's vote is decisive.

Article 9 :

A Coordination Committee will be formed to be chaired by the Center's Director and having as members the program co-ordinators. The Committee will be responsible for the proper co-ordination of the different projects of the Center.

Article 10 :

An account for the Center will be opened in a bank to be selected by the Board in two channels :

- a) for foreign currency.
- b) for local currency.

Article 11 :

Disbursement will be by cheques signed by the Director and the senior accountant.

Article 12 :

Financial resources of the Center are made up of :

- a) Sums paid by the ministries of the Government of Egypt, other government agencies and foreign organizations and institutions.
- b) Consulting and training services provided by the Center.
- c) Sums granted by US/AID according to the articles of the agreement No. 263-0061 date 17 August 1978, and any other Funds provided by similar agreement.

Article 13 :

Books and registers should be kept to control receipts and expenditures and show the financial situation according to the system to be approved by the Board of Directors.

Article 14 :

The fiscal year of the Center begins on the first of January and ends 31st of December of the same year.

During the two months following, the accountant should prepare a statement of the financial situation of the Center and submit it to the Board.

Article 15 :

The CU/MIT Project is considered one of the main programs of the Center, and the agreement No. 263-0061 concluded with US/AID on August 17, 1978 will remain on terms of reference.

PROGRAM ADMINISTRATION AND PERSONNEL

MIT:

MIT Technology Adaptation Program:  
Professor Fred Moavenzadeh,  
Director

TAP Executive Committee

Professor Nazli Choucri  
Professor Richard Eckaus  
Professor Fred Moavenzadeh

TAP Advisory Committee

Professor Nazli Choucri  
Department of Political Science  
Professor Richard S. Eckaus,  
Department of Economics  
Professor Fred Moavenzadeh  
Department of Civil Engineering  
Professor William L. Porter  
Dean, School of Architecture  
Professor William F. Pounds,  
Professor of Management;  
Dean, Alfred P. Sloan School  
of Management  
Professor George W. Rathjens,  
Department of Political Science  
Professor Jack P. Ruina,  
Department of Electrical Engineering  
Professor Eugene B. Skolnikoff,  
Department of Political Science;  
Director, Center for International  
Studies

CAIRO UNIVERSITY:

Rector of Cairo University:  
Dr. Ibrahim Badran

TPP Executive Committee

Professor Yehya Kabil  
Professor M. Zaki Shafei  
Professor Salah Shabbender

TPP Steering Committee

Professor Khairi Eissa, Dean,  
Faculty of Economics  
Professor Sobi Hakim, Dean,  
Faculty of Arts  
Professor Yehya Kabil, Dean  
Faculty of Engineering  
Professor Salah Shabbender  
Faculty of Medicine;  
Dean, Cancer Institute

Joint Advisory Committee

N. Choucri  
R. Eckaus  
F. Moavenzadeh

Y. Kabil  
Z. Shafei  
S. Shabbender

Program Staff

M.I.T. Administrator  
Technical Officer  
Liaison Officer Administrator  
Administrative Officer (Cairo)

Jeanne De Pass  
Kevin O'Toole  
General A. Mamdouh Hassan

جامعة القاهرة - معهد ماساتشوستس للتكنولوجيا  
برنامج التخطيط التكنولوجي

CAIRO UNIVERSITY - MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
TECHNOLOGICAL PLANNING PROGRAM

October 21, 1979

Cairo University  
Rector Office, Cairo University

Decision No. 153 of  
Rector, Cairo University  
dated 2/10/1979

Rector of Cairo University

- On reviewing the President's Decision of Law No. 809 for the year 1975 concerning the organization of universities and amended laws and
- The President's Decision No. 809 for the year 1975 concerning the issuance of the executive bilaw concerned with the organization Law for universities and its amended decisions, and
- The consent of Cairo University's Council in its session dated 28/2/1979 to the basic bilaw for the DRTPC
- And the decision of the Higher Council of Universities in its session dated 17/5/1979 adopting the basic "original" bilaw of the Center

decided

Article 1

A Board of Directors is to be set up for the DRTPC headed by me and the following professors as members:

- 1- Prof. Dr. Ali Mohamed Abdel Hafez El Salmi, Director, DRTPC
- 2- Prof. Dr. Mohamed Fawzy Hussein, Vice Rector for High Studies and Researches.
- 3- Prof. Dr. Mohamed Sobhi Abdel Hakim, Vice Rector for Students Affairs
- 4- Prof. Dr. Mohamed Taher Kira, Dean of the Faculty of Agriculture
- 5- Prof. Dr. Mohamed Zaki Shafei, Professor in the Faculty of Economics and Political Science

- 6- Prof. Dr. Hassan Ismail, Chairman of the Academy of Scientific Research and Technology
- 7- Prof. Dr. Abdel Razek Abdel Meguid, Minister of Planning
- 8- Prof. Dr. Ibrahim Helmi Abdel Rahman, Advisor to the Prime Minister

Article 2

Mr. Mohamed Farid Sharawi, Mr. Saad Morsi and Mr. Fakhry Nassar, Rector's Office, Cairo University, are to carry out the secretarial work.

Article 3

This should be valid as from date of issuance

**Dr. Ibrahim Badran**

**Rector, Cairo University  
Chairman, DRTPC**



مكتب رئيس الجامعة

قرار رئيس الجامعة

رقم ( ٤٠٤٤ ) بتاريخ ١٠/١٠/١٩٧٩

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رئيس الجامعة :

- بعد الاطلاع على قرار رئيس الجمهورية بالقانون رقم ٤٩ لسنة ١٩٧٢ بشأن تنظيم الجامعات والقوانين المعدلة له .
- وعلى قرار رئيس الجمهورية رقم ٨٠٩ لسنة ١٩٧٥ باصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له .
- وعلى موافقة مجلس جامعة القاهرة بجلسته بتاريخ ٢٨ فبراير ١٩٧٩ على اللائحة الاساسية لمركز بحوث التنمية والتخطيط التكنولوجي .
- وعلى قرار المجلس الاعلى للجامعات بجلسته بتاريخ ١٧ مايو ١٩٧٩ باعتماد اللائحة الاساسية للمركز .

قرار

مادة (١) يشكل مجلس ادارة مركز بحوث التنمية والتخطيط التكنولوجي بجامعة القاهرة برئاسة

برئاستنا وعضوية السادة :-

- |  |   |   |
|--|---|---|
| الاستاذ الدكتور على محمد عبد الحافظ الملقى | مدير المركز                               | - |
| محمد فوزى حسين                             | نائب رئيس الجامعة للدراسات العليا والبحوث | - |
| محمد صبحى عبد الحكيم                       | نائب رئيس الجامعة لشؤون التعليم           | - |
| محمد طاهر كبره                             | عميد كلية الزراعة                         | - |
| محمد زكى شافعى                             | الاستاذ بكلية الاقتصاد والعلوم السياسية   | - |
| حسن امامي                                  | رئيس ا카데미ة البحث العلمى والتكنولوجيا      | - |
| عبد الرازق عبد الجبيل                      | وزير التخطيط                              | - |
| ابراهيم حلمى عبدالرحمن                     | مستشار رئيس مجالس الوزراء                 | - |

مادة (٢) يتولى السادة / محمد فريد شعراوى ، سعد مرسى ، فخرى نصار - من مكتب رئيس الجامعة اعمال امانة مجلس الادارة .

مادة (٣) على الجهات المختصة تنفيذ هذا القرار وعلى من تاريخ صدوره

رئيس جامعة القاهرة

ورئيس مجلس ادارة مركز بحوث التنمية والتخطيط التكنولوجي

( د . ابراهيم جميل ) بدران