PD-AAZ-167

WATER AND SANITATION FOR HEALTH PROJECT

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EVALUATION OF OPERATION AND MAINTENANCE INTERVENTIONS: CAIRO SEWERAGE I PROJECT

WASH FIELD REPORT NO. 250

NOVEMBER 1988

Prepared for
the USAID Mission to Egypt
WASH Activity No. 452

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November 1988

Water and Sanitation for Health Project
Contract No. 5942-C-00-4085-00, Project No. 936-5942
is sponsored by the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development
Washington, DC 20523

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ACRONYMS

AMBRIC	American British Consultants
BOD	Bio-chemical oxygen demand (of wastewater)
(C/)	(Cairo/)
CSI	Cairo Sewerage I Project
CWO	Cairo Wastewater Organization
ENG.	Engineer
EQI	Environmental Quality International
GGC	Governorates of Greater Cairo
GOE	Government of Egypt
GOSD	General Organization for Sanitary Drainage
LE	Egyptian pound (LE 1 = U.S. $2.32)
m^3/d	Cubic meters per day
O&M	Operation and maintenance
SS	Suspended solids (of wastewater)
Supt.	Superintendent
USAID	United States Agency for International Development
WASH	Water and Sanitation for Health Project
WO IVA	Work Order IVA
WWTP	Wastewater treatment plant

EXECUTIVE SUMMARY

INTRODUCTION

The Cairo Sewerage I (CSI) Project was designed to improve the operation of the Cairo wastewater system, to design its expansion, and to improve wastewater disposal in unsewered areas. It included:

- Rehabilitation of the Cairo primary collection system;
- Training of operation and maintenance staff;
- Review and development of plans for the expansion of the system to the year 2000. It was later extended to include the rehabilitation of the secondary system, expansion on the Cairo West Bank, design of the East and West Bank systems, intervention in unsewered areas, and the provision of training and management advisory services.

CSI has improved the actual operation and maintenance of the Cairo system. Pump stations and sewer cleaning still have deficiencies but are more effective. Improvement is due to the combination of new equipment, training, checklists and evaluation of preventive maintenance, and management advice.

Termination of CSI and delay in Work Order IVA (WO IVA) was a setback. WO IVA offers the chance to regain lost ground in a supportive atmosphere within the General Organization for Sanitary Drainage (GOSD) and with liaison arrangements in place.

PUMP STATION AND SEWER CLEANING PERFORMANCE MONITORING AND OPERATIONS AND MAINTENANCE TRAINING

Training Impact

Training was one factor in the improved performance of pump stations and sewer cleaning. The performance monitoring checklist and rating system was a good indication of this. It is also demonstrated by the two-thirds reduction in flooding shown in the Environmental Quality International (EQI) evaluation of late 1987.

Training effectiveness and persistence was damaged due to the hiatus between the exhaustion of funds for training and the start-up of WO IVA. Training must be ongoing and receive management support. Further training is urgently required as there are only 600 trained so far (six to seven percent of work force).

Much greater training resources are needed, especially in equipment for "hands on" training. There is also a major need for management training for which a graduate program in management should be developed and existing courses utilized at the American University in Cairo and elsewhere.

Training facilities at Syphon and proposed at Ameria and Zenon should be expanded.

Performance Monitoring and Training

Key elements of the performance monitoring and training program were the initial needs assessment and training (which took into account lack of or levels of education, was taught in Arabic by respected GOSD engineers, and included many visual features). Preventive maintenance programs and checklists were developed. American British Consultants (AMBRIC) and GOSD staff regularly evaluated performance. This created healthy competition among the ejector stations for best performance.

GOSD Management Concerns

Current management is very anxious to expand training and properly equip a new training center as soon as possible.

Implementation Problems and Solutions of the Program

By 1991, clean water flowing into Cairo will exceed the capacity of the new and existing sewer system. Effective operation is essential. CSI rehabilitation of the pump stations followed by training, preventive maintenance checklists, and regular evaluations in 1985-87 were effective. The 18-month hiatus which followed caused some of the gains to be lost. This applies equally to the ejector stations and sewer cleaning. To reinstate the program the following steps are required:

- Checklists and evaluations must be restored.
- GOSD Technical Evaluation Department must be trained and made responsible for them.
- There should be annual competition with prizes for best station, crew, performance, etc.
- A new pump repair shop is urgently needed
- Better supply of and procedures for obtaining spare parts must be developed.
- Safety policy, equipment, and training are an urgent need.

- Public awareness is needed to avoid misuse of sewers.
- Better building regulations are required to prevent building without sewers and building over or burying manholes.
- Proper maps of sewers are required.
- New zone sewer maintenance depots are needed.

INSTITUTIONALIZATION OF THE PROGRAM

Effective operation of GOSD is subject to a number of constraints, especially lack of management autonomy and limited ability to raise its own revenues.

- GOSD should work toward autonomy, possibly as a public company raising its own revenues.
- USAID could work directly with GOSD on O&M matters.

The budget is inadequate but underspent and provision of foreign currency for spare parts is uncertain.

- GOSD should spend up to budget.
- WO IVA staff could possibly help in the preparation of the budget bid to the Ministry of Finance.
- GOSD should be given details of foreign currency allocation in time to order spare parts, etc.

PERSONNEL

Overall numbers are high, but there are still shortages in certain areas.

For long-term effectiveness:

- Management training should be a requirement for senior posts and others put to a supernumerary list.
- A staffing ceiling should be imposed at the present number.
- Use of the government retirement (age 55) provision would reduce numbers.

ESTIMATED COSTS

Approximate estimated costs are given in the report for additional training and training facilities, for support to O&M in new equipment and depots, and a small sum for institutional support amounting to a capital sum of an estimated $8,080,000 with annual costs of an estimated $285,000 (excluding training) from WO IVA funds until GOSD is able to finance itself.

(N.B. Annual training costs for USAID funding are also given at the end of Appendix E.)

ACKNOWLEDGMENTS

The team would like to thank the staffs of AMBRIC, CWO, GOSD, and USAID for their friendly reception and for the time given in endeavoring to meet endless requests for information.

We would also like to acknowledge the various institutes of learning which exist within Cairo and which provide a variety of management, financial and other training courses which may be useful to GOSD in the future.

- The Sadat Academy for Administration Studies
- The Arab Association for Management
- The Management and Development Arab Center
- The Dar El-Maaref Data Processing Center
- The American University in Cairo
- The Center for Planning and Architectural Studies

Chapter 1

INTRODUCTION

1.1 Background and Scope of Work

The Cairo Sewerage I (CSI) Project, funded by the United States Agency for International Development (USAID), had as its objective improvement in the functioning of the Cairo sewerage system, the design of its expansion, and the improvement of wastewater disposal in unsewered areas of Cairo.

As amended, the project provided for:

- rehabilitation of the primary collection system,
- rehabilitation of the secondary system,
- review of previous studies and the development of a plan for Cairo's needs up to the year 2000,
- design of the East and West Bank system expansion,
- intervention in unsewered areas,
- training operation and maintenance staff,
- training and management advisory services.

The operation management services are to be continued in Work Order IVA (WO IVA) just commenced under a follow-on project and this evaluation should also facilitate the use of future funding under the new order.

A request for technical assistance in evaluating the activities of the project as far as operation and maintenance (O&M), training, and management are concerned was issued by USAID/Egypt to the Water and Sanitation for Health Project (WASH). The original six-week study due to start in March 1988 was reduced to five weeks and commenced in September 1988.

The WASH team consisted of an engineer with broad experience in all aspects of O&M, a training specialist, an O&M specialist, and a social scientist. Members of the evaluation team are listed in Appendix A.

The study was designed to collect and evaluate information and results from the project to date. This was to be achieved by actually involving the General Organization for Sanitary Drainage (GOSD) staff, the Cairo Wastewater Organization (CWO), concerned American British Consultants (AMBRIC) staff, and the funding agency USAID.

The assignment included two days of workshops to discuss the draft final report and its recommendations and to prepare a slide record for use as a training aid. Workshop activities and outcomes are described in Appendix F.

1.2 Data Collection

Data and performance evaluation checklists collected by the contractor during earlier contracts and currently being collected in WO IVA were utilized. Detailed interviews were held with 69 senior and middle management staff, a sample of trainees of GOSD and CWO, and the contractor staff of AMBRIC and USAID. Although questionnaires were prepared, the interviews inevitably became open-ended and this proved beneficial (see Appendix B for list of interviewees). Site visits to 12 pumping stations, wastewater treatment works, training centers, and sewer cleaning crews were used to estimate current performance.

1.3 Methodology

The basic methods used for gathering data process were the evaluation sheets for pumping station performance, the EQI evaluation carried out in February 1988, site visits, progress reports, individual interviews and the documentation of WO IVA and the data so far produced for it.

The interview process included the following aspects:

- current O&M performance,
- performance monitoring and training activities developed,
- their impact on O&M performance,
- other factors affecting O&M performance,
- GOSD management concerns,
- complementary support required,
- institutional support required,
- recommendations for future policies of GOSD,
- recommendations for future funding activities, "notices", under WO IVA,
- likely costs to the program and assessments of benefits,
- methods of sustaining performance after USAID interventions are completed.

Chapter 2

OVERVIEW

A brief overview of the key findings of the evaluation is provided below. An analysis and presentation of data is provided in the chapters following.

- The objective of the operations and maintenance interventions under Cairo Sewerage I was to improve the actual operation and maintenance of the Cairo sewerage system. This has undoubtedly been successful.

- As the EQI study earlier this year shows flooded areas in 1987 were reduced by nearly two-thirds compared with 1981.

- Pump and ejector stations although still not maintained to a common standard are certainly more effective with fewer breakdowns.

- Sewer cleaning is carried out on a regular basis although not frequently enough and a few areas remain blocked due to lost manholes, etc.

- This improvement was due to a combination of capital works in new pumps and sewer cleaning equipment, training, the checklist and evaluations of preventive maintenance, and management advice.

- Unfortunately, just when the checklist and evaluations were beginning to show results, CSI terminated and due to delays in the start-up of WO IVA a hiatus of 15 months occurred, which was a setback and destroyed some of the gains.

- WO IVA with its flexible system of 'Notices' offers the opportunity to regain lost ground and to complete the process, especially in view of the enthusiasm of top management and the existing good liaison arrangements via the executive steering committee.

Chapter 3

PERFORMANCE MONITORING AND TRAINING

3.1 Background

At the inception of the Greater Cairo Wastewater Project, it was recognized that a training program for the more than 10,000 employees of the General Organization for Sanitary Drainage (GOSD) had to be established. In that regard, GOSD selected technical and managerial staff for initial specialized training on the types of facilities under design at that time. In addition, American-British Consultants (AMBRIC), the consultant group selected as contractors on the project, provided training which included courses in wastewater treatment plant and pumping station operation and maintenance. Support programs that provided workshops, laboratories, and training in the functions of warehousing, inventory control, and records management were also begun. Between 1980 and 1981, AMBRIC trained approximately 400 operations personnel.

The rehabilitation phase of the project, which represented a major capital investment in terms of construction and design, made clear the need to protect this investment by ensuring that the operating and maintenance (O&M) staff of GOSD would be prepared to operate and maintain these facilities properly on a continuing basis. In furtherance of this objective, USAID provided initial funding for an O&M training and assistance program. In October 1984 two U.S. operations and maintenance specialists were brought to the project to develop and implement a program of training and assistance. On the recommendation of the GOSD chairman, the O&M team was expanded to include two GOSD engineers as counterparts to the U.S. operations and maintenance specialists.

3.2 Training

The first effort of the training team was to conduct a needs assessment which included three major steps:

1. a concerted information gathering effort,
2. determination of existing and potential O&M problems, and
3. identification of training responses to remove the problems or lessen their effects on the system.

Because new equipment, controls, and methods of operation were incorporated into the rehabilitation of the pump stations, deficiencies of knowledge on the part of the maintenance staff resulted as to the proper maintenance

requirements of the system. Because of the complexity of the new equipment, the training design included the following elements:

- Given the various levels of formal education (e.g. from graduate engineers to illiterates), the use of basic vocabulary was chose.
- All training was presented in Arabic by the two GOSD engineers.
- Trainees were given a full explanation of the water cycle with emphasis placed on how their work was an important part of the cycle and, therefore, an important contribution to society.
- Readily identifiable analogies were used to emphasize key points.
- Visual aids were used extensively to reinforce the text of the lesson plans.
- The heuristic, or discovery, method of instruction was used.

3.3 Evaluation

Development and implementation of a performance monitoring checklist program was a critical part of the training and evaluation effort. The purpose of this checklist was to provide a solid, uniform basis of knowledge and understanding of specific job responsibilities and to bring the level of maintenance in the pump stations to a point where they could be kept in good working condition until more extensive assistance could be provided.

Factors of performance that were included in the evaluation were:

- Condition and maintenance of pump control panels
- Condition and maintenance of automatic controls (floats and alarms)
- Documentation of performance monitoring checklists and forms
- Condition of wet wells
- Condition and maintenance of auxiliary equipment
- Housekeeping
- Site safety.

A standard point-grading scale was developed with the factors most important to pump station performance receiving higher point values than other factors. After the results of the first evaluation were tabulated, the individual stations were ranked. The individual station results were also separated according to the seven administrative areas of the GOSD system. The area results were then compiled and ranked. This provided a fair way to measure the level of effort given to the consistent operation and maintenance at any single station, as well as a comparison of the overall efforts of the seven areas of the GOSD operations and maintenance department.

The overall results of the first evaluation were higher than expected. The results, however, identified certain aspects that required additional assistance, such as the need for detailed guidelines to properly fill in the checklists and forms. Between 1985 and late 1986 there had been six such evaluations. The results obtained in the sixth and last full evaluation at the end of Cairo Sewerage I are shown in Table 1.

Key elements of the improvement of performance of the stations include:

- Assistance of the O&M team.
- Competition between the seven areas that the evaluation subtly introduced.
- The realization on the part of the GOSD O&M staff that their work was regularly being observed by the management of their own organization and AMBRIC staff, and that good work was being recognized.

The evaluation program, which was designed to be flexible enough to meet a variety of changing needs and circumstances, contributed significantly to the increase in improvement of operations at the pumping stations. It also served as a continuing needs assessment and a means of accounting for the various job responsibilities associated with the stations. If applied on a consistent basis with adequate budgetary and other support, this program could serve as an effective training model for other GOE and USAID activities.

3.4 Impact of Training

Approximately 600 GOSD personnel received training through the five training programs offered as part of the rehabilitation program. GOSD officials continue to assert that trained personnel enhanced the efficiency of pumping operations. From observations, it is obvious that despite continuing problems in some areas, the overall operation of the system has been improved and that a significant part of this is due to training under CSI. This improvement can be attributed, in large measure, to hands-on, practical training, operation checklists, and to improved performance as demonstrated by periodic evaluations (see Appendix C).

TABLE 1

TRAINING GROUP EVALUATION OF REHABILITATED PUMP STATIONS
COMPARISON OF AREA PERFORMANCE

EVALUATED PUMPING STATION			NUMBER OF STATIONS EVALUATED	GENERAL EQUIPMENT	PUMP PANELS	AUTOMATIC CONTROLS	CHECKLISTS AND FORMS	WET WELL CONDITION	HOUSEKEEPING	TOTAL SCORE	PERCENTAGE (%)	PERCENT CHANGES (+ -)
RANK	STATION AREA	AREA ENGINEER										
1.	Embaba	Said	10	190 206	138 152	108 116	273 300	23 40	77 80	809 894	90.49%	+ 11.39%
2.	Souk El Samak	Aziz	10	152 176	152 154	104 114	280 300	22 40	66 74	776 858	90.44%	+ 2.86%
3.	Shobra	Hamdy	9	154 198	128 156	108 116	206 270	24 36	47 68	667 844	79.03%	- 5.55%
4.	Kobba & Materia	Gomah	7	108 132	94 104	62 76	149 210	15 28	37 44	465 594	78.28%	+ 2.87%
5.	Wassat	Gamel	4	48 68	56 64	30 48	71 120	12 16	22 30	239 346	69.08%	+ 6.09%
6.	Bab El Khalq	Hanify	12	162 230	96 158	88 134	173 360	18 48	63 88	600 1018	58.94%	+14.09%
7.	Al Haram	Hamed	4	64 92	22 62	32 46	15 120	5 16	22 32	160 368	43.48%	- 2.57%

Period Covered by Evaluation: 1.10.86 to 31.3.87
Minimum Acceptance Level for this Period: 64.58%

Source: CSI AMBRIC

Problems of flooding have varying etiologies. Among the causes discovered are:

- A substantial portion of the existing sewerage system was inadequate to convey daily flows.
- Sediment and grit had significantly reduced the carrying capacity of the collectors.
- Surcharged collectors prevented the free discharge of wastewater from the secondary system.
- Improper operation and maintenance of pumping stations.

If the data on flooding is analyzed before and after the rehabilitation program, which included the design and implementation of training, checklists and performance evaluations, it is clear that there has been a marked decrease in the incidence of flooding.

The rehabilitation program generally removed those flooding problems said to be caused by improper operation of the pump stations, improper manual and mechanical sewer cleaning, and pump failures, electrical and other operations and maintenance functions. The result of the improvement in operations and maintenance of the pump stations has not only contributed to a reduction in the incidence of flooding but "improved environmental conditions and the possibility of living a normal life." (EQI Evaluation, February 1988, p. 21). It is reasonable, therefore, to say that there has been a positive effect of training on performance and that the performance monitoring checklist/rating system is a reliable indicator of improved performance.

3.5 Training Effectiveness

The major elements in the success of the training interventions were:

- simplicity (e.g. usage of basic vocabulary, translation from English to Arabic for non-English speaking personnel, etc.);
- opportunity for hands-on, practical applications of the training;
- delivery or presentation of the training material by Egyptian staff who were held in high esteem by the participant trainees; and
- discussion of the role of the trainee and his importance to the overall efficient operation of the pump station as well as the consequent contribution made to the health and welfare of the society-at-large.

The objective of the O&M training team was to teach and assist the GOSD staff so the rehabilitated pumping stations would be properly operated and maintained. The ultimate goal was to ensure the sustainability of the project after donor involvement had ceased. In achieving goals and objectives of this type, however, questions must ultimately be raised as to the effectiveness and persistence of the training. It is clear that in order for training to be effective, certain variables must be considered:

- trainees must be motivated to use the newly acquired knowledge or skills;
- the training must be regularly reinforced;
- follow-up checks must be made.

These factors or variables are also a prerequisite to training persistence. Given the improvement in performance of the pump stations over the period during which evaluations were conducted and analyzed, it can be said that the training was not only effective but that its impact persisted. Training is an ongoing process and in order for this or any other training intervention to persist it is necessary to have a continuing education mechanism.

3.6 Future Training Needs

In interviews with GOSD, CWO, AMBRIC and USAID personnel associated with the Cairo I Sewer Project, respondents were queried as to what supports they felt were critical to the future success of the program. Reviewing the perceived needs stated by the various respondents and comparing them with our observations, the following list of additional training to be provided under WO IVA is suggested:

- More widespread training (electricians, mechanics, operators, etc.): At present out of the total population of the GOSD workforce, only six to seven percent of the employees have received any training.
- Training designed for illiterate employees: In order to assist them in understanding the significance of the work of the pump stations and the importance of carrying out their job responsibilities.
- Adequate spare parts at the work site: As a reinforcement mechanism for the conceptual classroom training, it is necessary to provide hands-on opportunities to understand the practical applications of the theory. The absence of spare parts and the procedural difficulty in obtaining them is a major complaint and is crucial to the success of any present or future training intervention.

- Safety training and equipment: Since 1985 six GOSD employees have perished due to inadequate understanding of the role of safety and the lack of safety equipment. Other employees have been involved in various types of accidents but statistical information on these events is not kept.

- Indigenous trainers: A cadre of Egyptian trainers must be developed who have the ability to translate, decode, and communicate conceptual and practical information to GOSD employees.

- Management training: The overwhelming majority of GOSD management has an academic background in engineering. While engineering is a profession which enjoys high esteem in the society, it does not necessarily prepare them to be managers and motivators of the personnel under their leadership. While there are many capable managers in GOSD, managerial training will provide the skills and techniques necessary to enable employees to reach their maximum potential.

- Incentives: Discipline is a useful and necessary management tool and can motivate workers to do their assigned work. However, it is much more desirable to motivate through pride rather than fear. One way of providing this motivation through pride and reinforce training is by personal recognition. When observed, verbal recognition of a worker for having learned well and done good work, in front of fellow workers, will instill great pride in that individual and motivate his fellow workers to strive for the same recognition.

- On-site training: Many managers complain that the workload at their pump station is so heavy that it is impossible to send personnel off-site to a training facility. In cases where three shifts are operating, two out of three of the workforce have no access to training at all. In instances such as this, training on-site could be provided to at least two shifts while allowing workload requirements to be met.

- Training center: Presently, training is conducted at the Syphon training center. In this facility, computer, electrical, mechanical, and other types of training are occurring simultaneously in an area that is barely suitable for one of these activities alone. Attention is an immutable prerequisite for learning, and the distractions, which are interminable in this small, cramped, crowded facility, are uncomplementary to the training process. A larger, fully equipped training facility would not only aid the process of learning/training but would allow greater access to training to more trainees in the various categories than is presently the case.

- Budgetary support: Since 1986 GOSD has not received any external budgetary support for its training activities. In fact, at the end of the last period of support from AID, all materials were withdrawn (e.g., copier machines, paper, etc.). Since that time, GOSD has provided LE 1,000* per year in an attempt to continue this vital function. Two facts are clear: (1) this level of funding for training is woefully inadequate and (2) in order for training to continue and survive sufficient donor funded facilities and financial support must be made available.

- Arabic-speaking consultants: To the extent possible, consultants who are fluent in Arabic should be made available for this and other projects.

- Commitment: A strong commitment must be made by GOSD to maintain continued emphasis on training for all levels of the organization. GOSD must make provisions for using training modules that have been designed and implemented on a continuing basis to train new employees and reinforce the training of existing staff through repetition.

It is hoped that the above future training needs will be addressed and given high priority under Work Order IVA.

3.7 Recommendations

In addition to sending staff to existing management training courses, a graduate program in management should be developed in conjunction with the American University of Cairo which would be offered to qualified engineers and technical staff who are filling or who will be filling management positions with GOSD or other Egyptian public utilities. A preferred approach would be for participants to attend the program on a part-time basis while remaining in full-time employment. By attending the masters degree program on a part-time basis it would take a minimum of three years to a maximum of six years to complete thus ensuring GOSD a reasonable amount of guaranteed service from the employees in return for GOSD's subsidizing the cost of the employee's participation in the program. A mechanism of this sort would go far in developing a cadre of trained managers.

Until the new central training center is provided, proposed facilities at Zenon in Ameria should be expanded and utilized as general and as specialized centers. Syphon should also be expanded.

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* An exchange rate of US $ 2.32/LE is used in this report.

Chapter 4

IMPACT OF PERFORMANCE MONITORING AND TRAINING ON OPERATIONS AND MAINTENANCE

4.1 General

Clearly the effective operation and maintenance of the original, the rehabilitated, and the new elements of the Greater Cairo sewerage and wastewater plants are vital element for the future of the city.

The efforts of 85 to 90 percent of the 10,579 GOSD staff are devoted to this end.

Nor does the task stand still, by 1991 the clean water supply will reach six million cubic meters a day (m^3/d) and, allowing for 70 percent entering the sewers, a reception capacity of 4.2 million m^3/d will be required.

By adding capacity of the new to the old sewerage system it is clear that a shortfal[1] exists.

New system	1.2 million m^3/d
Old system	2.1 million m^3/d
Total	3.3 million m^3/d

It will be seen that the O&M of the system will have to be at maximum effectiveness if major problems are to be avoided.

This shortfall in system capacity also shows the wisdom of retaining the old pump stations on a care and maintenance basis.

A considerable effort was made in Cairo Sewerage I to rehabilitate both the primary and secondary collector systems and to rehabilitate nearly half of the existing 104 pump stations. Equipment and management assistance was given to clean out accumulated debris in the sewers, and, as the EQI evaluation of early 1988 shows, the incidence of flooding has been significantly reduced (see Table 2).

In spite of this, remaining problems need to be tackled under WO IVA.

Another part of the project where progress remains to be made is the unsewered areas. Over two million people live in areas without access to sewerage and major developments, including multi-story apartment blocks, continue to take place with no access to sewerage.

TABLE 2

NO. OF FLOODED AREAS OBSERVED IN 8 DISTRICTS UNDERSTUDY IN SEPTEMBER - OCTOBER 1987

Name of Neighborhood	*No. of Flooding Areas		Comments
	in 1981	in 1987	
1. El Mounira (Tahrir/Talaat Harb)	10	6	2 chronic areas
2. Abou Heriera/Sekket Mekki	14	5	2 chronic areas
3. Nozeh/Shorafa (El Sakakini)	13	3	Not chronic
4. Kalet El Kabsh (Baghla)	6	3	All 3 flooded are chronic
5. Gezirat Badran	3	1	1 chronic not in original area
6. Al Awkaf City	10	1	Not chronic
7. Abou El Seoud	10	3	1 chronic - Tanneries (industrial waste disposal in the system)
8. Zolfakar	1	1	Not chronic
Total	**67**	**23**	**11 chronic areas**

* Source: AMBRIC - Pre-design Reports, General Summary of Drainage Areas and Proposals 1981

NB: Chronic flooding refers to a situation where sewage overflows the system causing pondage over the ground, in an extended area which never dries up. This situation is recurrent.

4.2 Current Pump Station Performance

After the good results reported from the six evaluations carried out by AMBRIC as part of Cairo Sewerage I, of the 49 rehabilitated pump stations it was disappointing to observe a declining trend of performance in the stations visited.

Much of the decline can be attributed to the hiatus in USAID input from the end of Cairo Sewerage I in 1987 to the startup of WO IVA in June 1988.

This is confirmed by a start-up re-evaluation of a sample of stations carried out by AMBRIC under WO IVA staff.

Figure 1 shows pump station area performance of the six evaluations 1985-86 and the 1988 partial evaluation in dashed lines. It will be seen that there has been a drastic fall off, none of the pump stations meeting even the original minimum acceptance level of fifty percent.

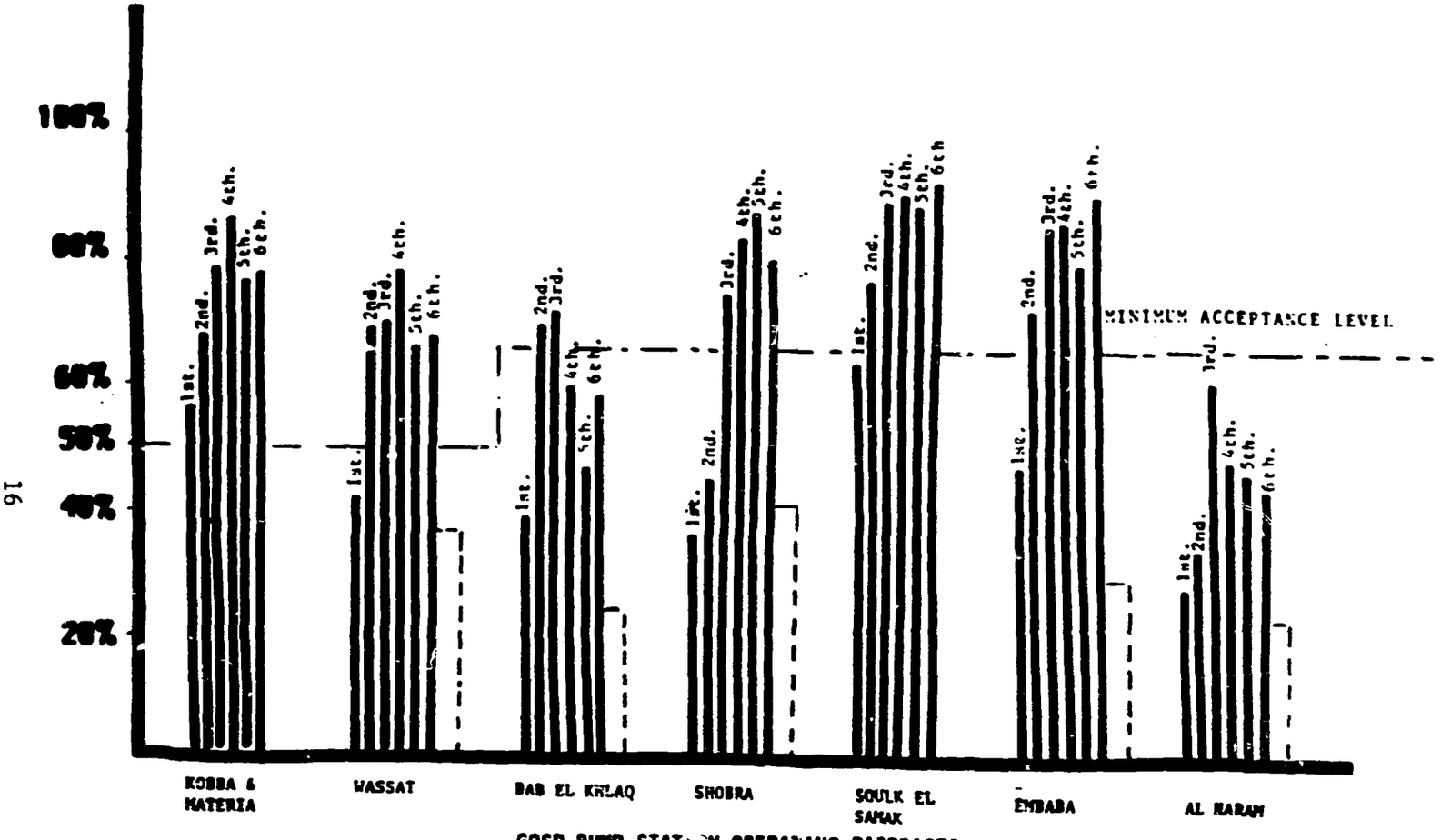
Obviously, the new stations are reasonably satisfactory and many of the old stations cannot be expected to be, but some old stations, due to self motivation by the superintendent are kept in reasonably good condition (e.g., Saida Zeinab), while some new stations lack safety equipment and show other deterioration problems.

Visits to 12 pumping stations or ejector stations revealed the following deficiencies:

1. Burned out pump control panels due to fuses being bypassed with wire.
2. Water leaking back through pumps when shut off.
3. No identification on pumps, motors, or electric control panels to indicate to the operators which pump the switch controls.
4. Most automatic float switches not used, pumps on hand control.
5. Cabling with bed connections looped on walls and floor with electric shock hazard.
6. Gate valves leaking.
7. Leaking pumps due to worn 'O' rings.
8. Pressure gauges not working.
9. Hatch way and vent openings for ejectors below ground level allowing water to enter the ejector chamber.
10. Minimal safety precautions: open chambers, manhole covers removed or cocked up, fire extinguishers either non-existent, empty, or time expired, no or inadequate first-aid kits, unguarded electric fans, broken glass.

FIGURE 1

PUMP STATION AREA PERFORMANCE



GOSD PUMP STATION OPERATING DISTRICTS

1st. Eval. period:	July	85	to	Oct.	85
2nd. Eval. period:	Oct.	85	to	Dec.	85
3rd. Eval. period:	Dec.	85	to	April	86
4th. Eval. period:	April	86	to	June	86
5th. Eval. period:	June	86	to	Oct.	86
6th. Eval. period.	Oct.	86	to	April	87
Partial evaluation	- - - -				88

11. No operations manual at any station visited.

12. Lack of tools to make minor repairs or adjustments.

13. Spare parts difficult to obtain for some makes of pumps.

14. Cumbersome procedures for obtaining spare parts.

15. Many stations without day-to-day schedules of pump operation.

16. Illiteracy of work force.

17. Cleanliness and hygiene below standard at almost all sites.

18. Little or no site security.

19. Changes of management staff at GOSD during the period 1986 to 1988 means that senior staff were unaware that the evaluation program had existed.

20. Checklists fell into disuse at stations due to the inability to obtain fresh copies of the form resulting from the very limited photo copying facilities at GOSD.

21. About 70 pumps, nearly one per station, awaiting repair at the very inadequate pump repair shop at Souk El Samak.

There are bright spots like the existing pump station at Ameria where the checklist has continued in use and been expanded by the station engineer and has full preventive maintenance scheduled.

Where pump station performance has been maintained or improved it has been due to the presence of capable engineers with natural management ability and a high degree of self motivation.

It should be the aim of WO IVA to provide the climate in which such initiative can be developed and rewarded.

It also reinforces the view that a top down training plan is needed. Interventions at lower levels of management tend to wither unless higher management is knowledgeable and supportive.

4.3 Current Ejector Station Performance

In the center of Cairo as well as the normal pump stations there is a system of ejector stations, driven by compressed air, for the conveyance of wastewater.

The system dates from 1935 and originally consisted of 50 ejector stations of which 40 remain in use, as well as three air compressing stations and a compressed air network to the ejectors.

Given the age of the system, the need for ejector valves, etc. to seat properly for effective operation, maintenance requires considerable effort. Another problem is that ejector stations are completely underground and vehicles parked over them prevent access to them.

In the CSI report dated April 1987, 19 maintenance and other problems were itemized with proposed solutions and reference was made to preventive maintenance checklists. However, only one evaluation at the end of 1986 was done. This was just as the CSI project ended, and it is now stated by the Ejector Department that only breakdown maintenance is done.

Safety is again largely ignored. At the Maarouf Air Compressing Station, the station floor is saturated with oil and one machine was running with no guard over the rotating shaft.

4.4 Recommendations

1. The April 1987 report should be updated and its recommendations implemented.

2. Checklists and evaluations should be reinstated for preventive maintenance.

3. The Technical Evaluation Department should be trained in the use of the scheme and made responsible for its operation.

4. They should be required to produce regular reports both upward and to the head of O&M but also downward to the participating areas.

4.5 Pump Station Performance Monitoring

In order to safeguard the major investment in Cairo Sewerage I represented by the 69 new or rehabilitated pump stations, a training and assistance program was provided. The needs assessment revealed that the performance of pump stations depended on other factors as well as staff skills and training and, based on this, an evaluation program was produced which is detailed in section 3.3.

The results obtained in the sixth and last full evaluation at the end of Cairo Sewerage I are shown in Table 1 in Chapter 3 above.

It is possible to demonstrate the difference between good and bad rated stations only at Ameria where, before the stations were rehabilitated, significant breakdowns averaged ten per year. Since rehabilitation and the introduction of weekly, monthly, quarterly, and annual preventive maintenance no significant faults have occurred.

No cost savings can be quoted as the costing systems, etc., which would enable this to be done are to be designed under WO IVA and it will be some time before reliable cost data will be available on which such a study could be based.

The end product is reduction in Cairo sewer flooding. This is a problem overcome which cannot be costed and is a public benefit, not a cost saving to GOSD.

It could, however, be assessed by using Landsat satellite pictures of Cairo which are available for the period covered by CSI which, with expert interpretation, could give the annual areas flooded and measure the improvement obtained.

AMBRIC-inspired evaluations ceased when CSI staff were withdrawn in 1987 as it had not been properly integrated into any GOSD management system.

As forms ran out and could not be replaced, enthusiasm ran out except in one or two areas where the effort was maintained or even improved.

With the start-up of WO IVA, an inventory of all pump stations is being carried out and at the same time an informal checklist evaluation is being carried out. Results so far are seen as a dotted line in Figure 2. This shows the ground that has been lost due to the time lapse between USAID interventions.

Another factor in the downturn is the unsatisfactory state of pump repairs and the necessarily limited impact of training due to the large numbers requiring training.

The scheme, however, is well conceived and does provide a good training model and could readily be transferred elsewhere, provided that it is supported by management and fully integrated into the management systems of the organization.

4.6 Recommendations

To regain lost ground and provide a firm base for the future the following is required:

- The technical evaluation department should be trained in the use of the performance monitoring scheme and made responsible for its operation.
- They should be required to produce regular reports both upward and to the head of O&M, but also downward to the participating areas.
- An annual competition should be run with prizes for the best station and the most improved station of the year. The prizes should be presented by the chairman and given publicity. (N.B. A staff newspaper is needed for this and many other reasons).
- A new pump repair shop is of the highest priority.

- Improvement in the supply of spares, tools, and equipment and a reduction in the cumbersome and time consuming procedures (this is stated to be in hand but evidence is lacking).

- Local budgets should be provided for day-to-day small items. (In the S. Zone with 30 pump stations the cash float is LE 100!)

- Safety and security equipment and standards are almost non-existent. A GOSD safety and security policy, a proper scale of equipment, safety training, and safety exercises are urgently needed.

- A major increase in the scope and numbers of training is required.

4.7 Current Sewer Cleaning Performance

The sewer cleaning program carried out under Cairo Sewerage I had, as has already been noted in Table 2, a considerable degree of success.

Sewer cleansing has become a routine operation and crews have been allocated to carry out frequent cleaning where known problems exist. Cleaning programs are often interrupted to deal with emergencies but this is a fact of life in a public utility and crews would be under-employed if dedicated solely to emergencies.

The simpler tasks (winch/bucket cleaning, catchpit emptying, and manual rodding and sewer 'diving') are carried out reasonably effectively without significant over-manning.

However, the more expensive items of plant are either under-employed or not used at all.

Two closed circuit television vans (CCTV) for sewer inspection have been supplied. These should be in daily use to inspect all new sewers for defects before acceptance by GOSD and to survey existing sewers to find defects, illicit connections, etc.

Before being used, the sewer should be jetted to clean it and remove obstacles. This was not done, and it is obvious that CCTV has not been used for some time.

Although managers complain of lack of equipment, jetters seem only to be used in emergencies and two jetters are laid up at the new garage for lack of a parts list needed to order spares, a problem solvable in five minutes by an air letter to the makers quoting the chassis number.

There must be known areas that should be routinely jetted, thus, releasing winch gangs for work in other areas.

There are areas which have never been properly cleared. In the third collector a large number of manholes have been buried and cannot be found using box finding equipment. This also applies to the second collector where manholes are buried under ruins. There are also special problems at the Teret El Galad collector which needs expert attention.

4.8 Implementation Problems and Recommendations

1. In the public domain sewers are constantly misused, blocked with rubbish, animal carcasses, etc. A public awareness program is urgently required to educate the public in basic hygiene and the importance of the sewerage system.

2. Improvements are needed in the building regulation and planning field. Not only are multi-story apartment blocks built in unsewered areas but manholes are built over, sewers covered over, and manhole covers buried by highway surfacing crews.

3. A strengthened system of control of effluent from factories is needed with a laboratory, an adequate inspectorate, transport, and effective penalties to ensure that effluent from factories reaching the sewer is free of gross solids and that heavy metals, chemical pollutants, aggressive acids or alkalis are removed and/or pre-treated effectively before entering the sewer and that proper charges are paid for treating sewage of high bio-chemical oxygen demand (BOD) or suspended solids (SS) compared to domestic sewage.

4. A program to map the Cairo Sewerage System properly is needed, possibly in conjunction with the digital mapping pilot project of the Governorates of Greater Cairo (GGC).

5. In view of the level of sewer blockages, more use should be made of jetters, CCTV should be re-introduced, and shift working introduced for sewer cleaning crews to maximize use of plant.

6. Additional equipment and spares are required, especially more and better trailers.

7. The degrading and dangerous occupation of sewer 'diver' must be abolished as an urgent priority. (N.B. Each manual cleaning gang, as well as using rods to remove blockages employs a man, almost unclothed, who enters the sewer on a rope and removes the blockages with his bare hands. The risk of drowning, asphyxiation, or disease--especially the potentially fatal Weils disease spread by rats urine--must be high. The diver is consoled by a ten percent bonus for this!)

8. The provision of a crew under a competent engineer is needed to find, improve, or build manholes on lines where existing manholes are lost and then to clear the blockages in them.

9. Spares must be obtained for the two sewer jetters at the New Garage and they must be re-activated.

10. The Souk El Samak sewer maintenance depot which is cramped and unsuitable must be replaced with properly designed and equipped zone depots.

11. Safety and security equipment and standards are almost non-existent. A GOSD safety and security policy, a proper scale of equipment, safety training, and safety exercises are urgently required.

12. The technical evaluation department should be trained in the sewer cleaning evaluation scheme and made responsible for its re-introduction and operation.

13. The technical evaluation department should be required to produce regular reports both upward to the head of O&M but also downward to the participating areas.

14. Annual awards should be given for the best and most improved performances.

15. Existing locally manufactured manhole covers and frames are of poor quality metal and much too heavy. A new cover should be designed based on best practice and arrangements made for quality-assured manufacture.

4.9 Key Elements of the Assistance Program

The success of the CSI Program lay in the blend of:

- capital works: the rehabilitation of pump stations;
- the provision of equipment: mechanical sewer cleaning equipment;
- training: some 600 staff trained; and
- practical advice on and systems implementation of sewer cleaning and checklists for preventive maintenance.

All were vital in the success of the program.

The final element, continuity and long-term monitoring, was absent. CSI terminated abruptly in 1987 with systems not wholly implemented and the 15-month delay before the continuation as part of WO IVA has been severely damaging in terms of loss of interest and changes of management leading to loss of awareness of the systems.

It is essential, as part of WO IVA, that sufficient time be allowed for re-implementation of the performance monitoring and for its integration into the management system of GOSD. It is also desirable that its effectiveness be checked by USAID for as long a period as possible.

After WO IVA staff are withdrawn, the U.S. Twinning Authority provided for in WO IVA could play a role by discussing annual objectives with GOSD and by carrying out annual monitoring visits by one or two senior staff to assess progress and revise targets. It would be reasonable to expect USAID to fund air fares and subsistence costs for this.

Chapter 5

INSTITUTIONAL SUPPORT FOR OPERATION AND MAINTENANCE

5.1 General

The effective operation of the Cairo General Organization for Sanitary Drainage (GOSD) is subject to a number of constraints. Among them are:

- A population to be served of at least twelve million increasing at the rate of 300,000 a year, much of it in areas without sewers.
- Two million people already living in areas without sewers.
- A workforce of 10,579 inadequately trained, poorly paid, and, as a result, without sufficient motivation.
- An overloaded management structure with too many reporting to each senior manager and minimal delegation of authority and responsibility.
- The effectiveness of the professional staff hampered by lack of management training.
- GOSD as a government body subject to close regulation of pay, working conditions, and job tenure which inhibit the recruitment and retention of able staff and the removal of inadequate staff.
- Entirely dependent for revenue on grants from the Ministry of Finance.
- Revenue received covers salaries, wages, energy costs, and consumables with very little available for training, etc.
- A sewerage system which, although the subject of very substantial aid for new major collectors, pumping stations, and wastewater treatment plants, will, nevertheless, continue to incur substantial maintenance costs due to the sandy environment, the lack of records, and the poor condition of many sewers.

5.2 Organizational Structure

GOSD is a government body without any significant revenue of its own, tied to government salary scales and other conditions of employment and with insufficient management autonomy. For example, the expansion of sewer cleaning crews is hindered by the lack of vehicle drivers who cannot be recruited due to the low pay scales offered. This is clearly an obstacle to the long-term success of O&M (see Figure 2 and Table 3).

An effective long-term answer might be the creation of a public company able to raise its own revenues and given a substantial measure of autonomy by the government. In the West, activities like sewer cleaning and pump station maintenance are being privatized and this might be the subject of future consideration.

Under CSI, where much of the emphasis was on capital expenditure, USAID worked through CWO on works ultimately intended to be taken over by GOSD. In the future, as far as O&M activities are concerned, there seems little reason why USAID should not deal directly with GOSD. Collaboration between CWO and GOSD now appears to be good but the delay in starting up WO IVA may have been due to the bilateral procedure needed.

5.3 GOSD Budget for O&M

The GOSD budget is shown in Table 4. A separate account is not kept for O&M but its cost may be inferred.

Assuming 90 percent of salary costs relate to O&M, the budget appears to be as set out in Table 5 for the year 1987-88.

The first point to note is that the budget is nearly LE 1 million underspent. This is a weak base to argue the case with the Ministry of Finance for greater funding.

Thus, in the current year funding, other than for capital works, which is almost entirely for O&M, has had its bid reduced from LE 51,031.750 to LE 37,737.000 which is less than the current year LE 38,152.292, in spite of a high level of inflation. The completion of GOSD-generated capital works of LE 81 million during the year, which will now need an O&M budget, not to mention the AMBRIC works coming on stream, will further stretch this budget.

When the computerized management information systems to be installed under WO IVA are up and running, better budgeting data will enable a better case to be made to the Ministry of Finance.

In the meanwhile, every effort should be made to at least spend the sum allocated, and perhaps WO IVA staff could assist in preparing the budget case to the Minister.

With current manning levels, the budget is too small but might be more adequate if manning levels could be reduced and remaining staff better paid.

FIGURE 2

EXISTING ORGANIZATION CHART OF GOSD

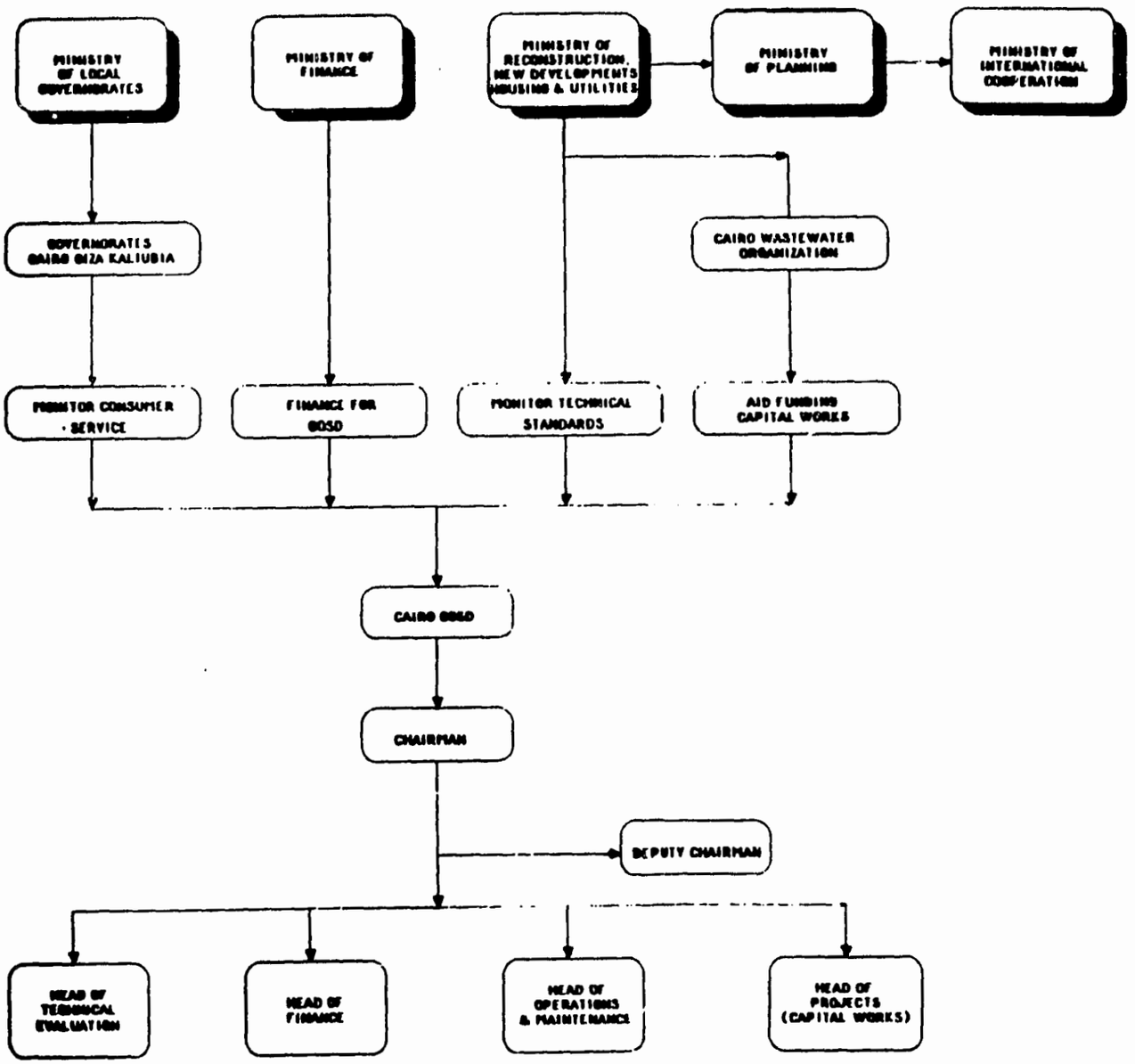


TABLE 3

STAFF BY CLASSIFICATION

1. **Specialized Cadre**	Engineers	275	
	Scientists	20	
	Agricultural Engineers	43	
			338
2. **Administration**	Accounting	106	
	Admin. Development	68	
	Statistics	7	
	Security	2	
	Legal	33	
			216
3. **Intermediate Technical**	Engineering Support	467	
	Architecture	4	
	Technical Laboratory	8	
	Architecture - Nutrition	30	
			509
4. **Clerical**	Qualified	712	
	Unqualified	127	
			839
5. **Technical Labourers**			4278
6. **Support Staff**			4097
Grand Total			**10277**

Note: This varies somewhat from the total current figure of 10579 but is the best available. The total number of posts in the staff establishment is 12,000.

TABLE 4

GOSD BUDGET
FINANCIAL YEARS 87/88 & 88/89

SECTIONS	YEAR 87/88		YEAR 88/89	
	Approved (LE)	Disbursed (LE)	Proposed (LE)	Approved (LE)
1. Salaries & Incentives	30.226.292	29.931.539	34.297.000	30.488.000
2. Operation, Maintenance, Training, Services, etc	7.926.000	7.177.940	16.734.750	7.249.000
3. Projects, New & Ongoing	85.755.000	81.583.378	142.345.000	92.424.000
4. Loans & Interests due to be paid • for Customs	8.417.000	8.417.000	24.278.891	23.557.000 + 17.380.000 40.937.000

TABLE 5

EXTRACT OF GOSD BUDGET 87/88
DIRECTLY RELATED TO O & M AND TRAINING

SECTION 2	Proposed (LE)	Approved (LE)	Disbursed (LE)
1. Materials	8.000	5.000	4.019
2. Fuel, Oil and Power Generation	3.626.300	3.702.500	3.564.773
3. Spare Parts & Tools	1.900.000	1.653.800	1.132.665
4. Stationery & Books	57.500	37.700	36.040
5. Service & Research Work	500	1.400	1.115
6. Printing Costs	20 000	20.600	20.263
7. Cost for Training Courses	9 560	2.200	1.570
8. 90% of Salary Costs	29.768 400	27.203 662	26.938 385
Totals	**35.390.260**	**32.626.862**	**31.698.830**

The capital works built every year continuously extend the system requiring O&M. A rising O&M budget is essential if O&M is to meet its task.

A further problem in procuring tools, machinery, and spare parts is the acquisition of the foreign currency needed to import these items. The O&M budget is in Egyptian currency and to get its equivalent in the appropriate foreign currency, GOSD has to make a convincing case against other competing demands to the Governorate of Cairo and the Ministries of Local Governorates, Planning, Finance, and Housing. GOSD asked for LE 5.5 million for spares but were allocated only LE 1.5 million with a promise of more if foreign currency is available, but nothing is known for certain. This explains why some spare parts take a long time to obtain.

Recommendations:

- Give higher priority to the management system implementation already in WO IVA.
- GOSD should make every effort to spend up to budget.
- GOSD should be told early in the year what its foreign currency allocation will be so that urgently needed spares can be ordered.
- Consideration should be given to WO IVA's assisting in the preparation of the budget bid to the Ministry of Finance.

5.4 Personnel

Information provided on the manning levels at pump stations, workshops, and other sites, compared with those which would be considered adequate on similar sized sites in the U.S. or Europe, indicates high numbers of manpower. It is understood that some of the manpower is accounted for by skill shortages and the national need to sustain a high level of employment.

When the organization and manpower plan being prepared as part of WO IVA is in place, the problem will arise, given government employee security of tenure, as to how reduced manpower and cost savings are to be achieved.

- It is recommended that in the higher echelons, able staff willing to undergo management training be slotted into posts in the new establishment. Others should be transferred to a supernumerary list and as they retire the post be abolished.
- It is recommended that an immediate ceiling on numbers at the present level be imposed.

- It is recommended that the government law allowing retirement at 55 with certain pension rights be used to encourage as many as possible over 55 to retire without replacement.

5.5 Publicity Internal and External

The public relations activities of GOSD need urgently to be expanded. This means educating the public not to misuse sewers and, internally by means of a newsletter, raising staff morale and highlighting meritorious performances (also see recommendations in section 4.6).

5.6 GOSD Management Views and Perception on Training and its Impact on O&M

Although everybody in the different echelons of management agrees about the necessity of continuous training for all levels of the workforce, they still differ very widely about the effect of the training carried out either by GOSD or AMBRIC in improving actual operations and maintenance of the sewerage system. This is largely due to the following:

1. Shortage of funds allocated for training in GOSD budget, which was LE 1,570 in 1987-88.
2. Disruption of technical assistance including training provided by the consultant for about 15 months.
3. Non-existence of a policy for training, identifying targets, means, programs, personnel, etc.
4. The existing training center at Syphon is totally inadequate and the small training staff with their tiny budget deserve great credit for the training they have achieved, but it is totally inadequate to meet the need.
5. The low priority given to training vs. construction, design, and O&M activities which is a common feature in governmental organizations.
6. The illiteracy of much of the work force.
7. No incentives, promotion, or any kind of reward related to successful training.

To achieve a significant improvement in training, a long-term training policy should be established and enunciated, an adequate budget should be allocated in GOSD, and through the resources of WO IVA a powerful, enthusiastic, energetic department for training should be started giving priority to training activities as the backbone for success in any sphere of work.

Chapter 6

RECOMMENDATIONS AND ESTIMATED COSTS

The recommendations and costs indicated in this chapter refer to the above discussion and have the objective of institutionalizing the recommended program and of ensuring that long-term benefits ensue. Cost estimates have been formulated based on the following considerations.

- Estimated costs are only given for items not at present in the WO IVA program or are modified.
- Estimates in the time available can only be 'ball park' figures.
- All are at 1988 prices.
- In the case of annual costs these will continue for as long as AID funds can be made available or until GOSD finances improve.
- If and when any of the recommendations are considered for notices under WO IVA, it is essential that AMBRIC calculate in more detail and add inflation factors in the customary local format.

COST ESTIMATES OF RECOMMENDED ACTIVITIES

Performance Monitoring and Training

(In addition to that already provided in WO IVA)	Capital Costs	Annual Costs
(For details see Chapter 3 and Appendix E)	$ 1,625,000	—

Impact of Performance Monitoring and Training on Performance of Operations and Maintenance

(See Chapter 4 for details)

• Annual competitions for best station, etc.	Awards cups, trophies could be gift of consultant or Twinning Authority	
• New pump repair shop	$ 500,000	$ 25,000
• Safety equipment	$ 300,000	$ 30,000

	Capital Costs	Annual Costs
• Trade effluent lab, inspectors, transport	$ 2,500,000	$ 50,000
• Sewer mapping	$ 250,000	$ 35,000
• Better sewer cleaning equipment, e.g. trailers	$ 150,000	$ 30,000
• Manhole improvement program	$ 50,000	$ 25,000
• Replace sewer maintenance depot by five new zone depots	$ 2,500,000	$ 50,000
• Safety equipment for sewer cleaning	$ 150,000	$ 15,000
• Awards for best teams	Gift of consultant or Twinning Authority	
• Better design of manhole cover	$ 10,000	-
Institutional Support for Operation and Maintenance		
(See Chapter 5 for details)		
• Pilot study of feasibility of privatizing sewer cleaning and P.S. maintenance	$ 20,000	-
• WO IVA staff assist in budget bid preparation	Within existing resources	
• Ceiling on numbers and early retirement	NIL (Cost saving)	
• Realistic publicity budget, newsletter, etc.	$ 25,000	$ 25,000
TOTALS	$ 8,080,000	$285,000*

* Excluding training (see Appendix E).

Appendix A

MEMBERS OF EVALUATION TEAM

Appendix A

MEMBERS OF EVALUATION TEAM

J. Anthony Young	WASH (Team Leader)
A. Tarik Bnafa	WASH
Wefky Monsour	WASH
Imam Ghazalla	EQI
Youssef El Rafei	EQI

Appendix B

LIST OF PERSONS INTERVIEWED

APPENDIX B

LIST OF PERSONS INTERVIEWED

A. GOSD (The General Organization for Sanitary Drainage)

Mohamed Farid Sewelam	Chairman of GOSD
Mohamed Mohamed Nasser	Vice Chairman of GOSD
Ishak Metry	Director of Central Planning Division
Abou El Elah Mohamed El Sayed	Head of Operations & Maintenance Division
Said Ayyad	General Director of Financial Affairs
Samir Badr El Din	General Director of Mechanical & Electrical Division
Abdel Aziz El Malatawy	General Director of Accounts
Abdallah Ashmawy	Director of Public Relations
Ismail Metwalli	Deputy of Budget Administration
Lulu Salama Khalil	Director of Information Center
Mohamed Ismail	Head of Inspection Division
Abdel Nasser Abdel Fattah	General Director of the Western Region
Hamdy Hassan Massoud	General Director of the North Cairo Region
Hamed Waly	Director of South Giza Region
Salah El Din Taha Mahmoud	General Supervisor of the Mid Zone Stations
Abdel Kader Hamdy	General Supervisor of the Helwan Region
Ahmed El Kot	Director of Souk El Samak Pumping Station
Mahmoud Ismail	Director of Ameria Pumping Station
Mohamed Abdel Fattah	General Director of the Vehicle Repair Shop
Mohamed Khattab	Head of Mechanical Sewer Cleaning Division
Ramadan EL Saghir Mohamed	Head of the Submersible Pumps Workshop
Amira Ibrahim Hussein	Lab Supervisor/Chemist Heliopolis
Milad Ibrahim Yacoub	Training Coordinator
Tharwat Mohamed Mostafa	Treatment Stations Engineer (Work Order IVA)
Mohamed Sayed Saleh	Engineer/Supervisor of the Syphon Pumping Station
Samy Youssef	Engineer Ejector Stations
Samia Samy Salim	Civil Engineer (Work Order IVA)
Mohamed Gamal Ishak	Mechanical Maintenance Engineer

Ahmad Abdel Salam	Engineer Mechanical Sewer Cleaning Division
Hassan Mabrouk Abdallah	Maintenance Engineer, Vehicle Repair Shop
Ahmed Aly	Engineer Sewer Cleaning
Aly Afifi	Engineer Sewer Cleaning Repair Shop
Madelaine Labib Henein	Chemist (Work Order IYA)
Mohamed El Sayed	Supervisor of the Submersible Pump Workshop
Abdel Aziz Mohamed Shahri	Supervisor of the Syphon Pumping Station
Ahmed El Shazly	Mechanic Submersible Pump Station Workshop
Yehya Abdel Fattah Mohamed	Operation Worker Syphon Pumping Station
Abdel Malek Abou El Fettah	Electrician Submersible Pump Workshop
Wagih George	Industrial Safety Official Submersible Pumps Workshop
Mohamed Abdel Wahid	Gamaa Station
Salah Wanis	Giza Station
Abdel Salam	Dayoura Station
Samir Abdel Meneim	Head of Training Division

<u>Sample of Trainees Interviewed:</u>

Eng. Said Ibrahim El Zomor
Ahmed Mohamed Yehya
Fathy Hussein Aly
Gomaa Refey Hussein
Beyoumi Mohamed Mahmoud
Awad Abdel Ghani Mahmoud

B. USAID

Fred Zobrist	Associate Director Development Resources
Hassan Hassan	Office Director U.A.D.
Sally Patton	Project Officer
Mike Gould	Chief of Division Cairo Branch U.A.D
Vikha Molldrum	Evaluation Officer
Kass Kawata	Consultant
Safwat Bishara	Cairo Sewerage 2
Tarek Bekheit	Program Development Support

C. AMBRIC

Chuck McElRoy	Chief of Project LA
Eric Duffey	Institutional Development Specialist
Tim Swayne	Assistant Project Director East Bank Works
Wayne West	Training Coordinator
Ken Stumpf	Operation and Maintenance Specialist
Paul Gustafson	Unsewered Areas Project
Buck Osteen	Environmental Engineer
Hassan El Hosseini	Computer Training Specialist

D. OTHERS

Salah Issawi	Under-secretary Training Department Ministry of Housing & Reconstruction
Rifki Hassan	CWO
Matt Antill	Former Training Coordinator of AMBRIC
Youssef Rizkallah	Former Director of O & M in GOSD, currently Trainer in the Ministry of Housing

Appendix C

TRAINING PROGRAM PRESENTED

APPENDIX C

TRAINING PROGRAM PRESENTED

TITLE	GOSD PERSONNEL ATTENDING					
	ENGINEERS	SUPERVISORS	MECHANICS	ELECTRICIANS	OPERATORS	TOTAL
Pump Station O & M Training	8	14	181	43	24	270
Electrical Short Course Training for Pump Control Panel Rewiring	8	5	0	7	0	20
Ejector Station O & M Training	0	8	71	0	67	146
Technical Training Course for Pump Station Electricians (Trainee data as of 11/12/86, this training is still ongoing)	23	17	0	31	0	71
Technical Training Course for Submersible Pump Repair (Trainee data as of 8/12/86, this training is still ongoing)	13	18	51	1	4 (a)* 1 (b)**	88
TOTAL						595

* a= Assistant Mechanics
** b= Laborer

Appendix D

REFERENCES

APPENDIX D

REFERENCES

- Evaluation of Cairo Sewerage I - Rehabilitation
  by EQI

  February 1988

- Rehabilitation and Expansion of the Greater Cairo Wastewater System
  WO IVA

  January 1988

- The Greater Cairo Wastewater Project Operations and Training
  Wayne West, Paul L. Gustafson, Fred A. Zobrist, Eng. Attala Safwat
  Water Pollution Control Federation L.A. California

  October 1986

Appendix E

TRAINING COSTS

APPENDIX E

TRAINING COSTS

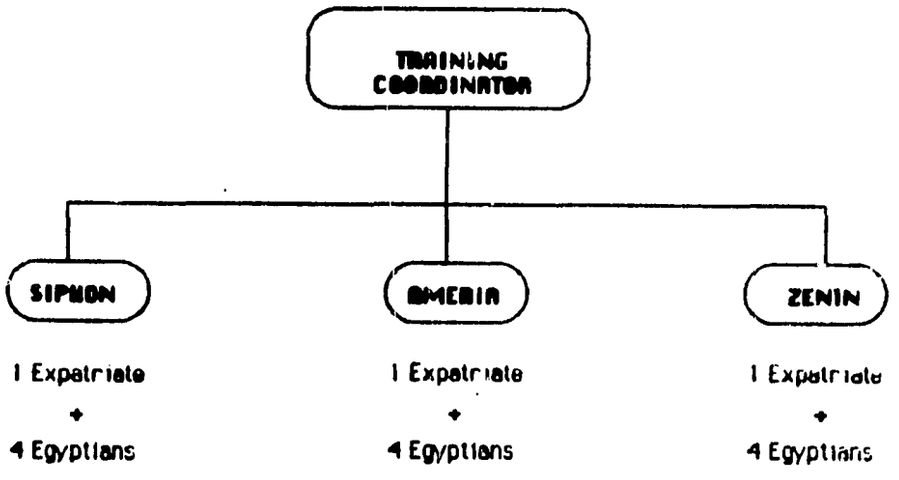
Long-term Training:

AUC - Graduate Degree Program (5 years) cost would be approximately $ 2,000/yr/person x 15 persons/year for 5 years = 75 persons over a 5 year period @ $ 10,000/persons = $ 750,000.00. Persons participating in this program would be those identified as having capability for the executive management track. One decision properly made by one of the participants in this program after reaching an executive position in the organization would more than justify the cost of this program.

Year	1	2	3	4	5	6	7	8	9	0
Participants*	15	30	45	60	75	60	45	30	15	0
Cost: US $ (000)	30	60	90	120	150	120	90	60	30	0

Short-term Training :

Staffing



Costs:

4 Expatriates	- $ 200,000 each (includes overhead)	= $ 800,000
12 Egyptian staff	- $ 10,000 each/yr (includes overhead)	= $ 120,000
		$ 920,000/yr

These persons would be responsible for administrative, technical, production (manufacture of training materials, training of trainer (TOT) training; manuals, audio-visual tapes, etc.) and all other short-term training interventions.

Equipment

Audio-visual (including VCR's and Cathode Ray Tubes)	= $ 200,000
Copiers, typewriters, etc.	= $ 50,000
Tranportation - (3 vehicles/training center + spare parts + insurance, shipping costs, etc.)	= $ 225,000
Annual Maintenance + Insurance/Vehicle	= $ 45,000/yr
Training/Office Supplies	= $ 25,000/yr
Computers	= $ 80,000
Annual Maintenance	= $ 10,000/yr
Ten Training Terminals + CPU	= $ 100,000
Annual Maintenance	= $ 10,000/yr

Facility

In order to prepare the three facilities (Amerie, Siphon, and Zenin) for operation and training, the following are "ball park" estimates of the costs:

Siphon (Expansion + Rehabilitation)	$ 100,000
Amerie	$ 500,000
Zenin	$ 500,000
	$ 1,100,000

In subsequent years, annual upkeep and maintenance is estimated at approximately $ 20,000/yr/facility.

It should be borne in mind that while these costs may appear large at the outset, they are normal start-up institutionalization costs (facility, staffing, equipment, etc.). As the program continues these costs are reduced and the unit cost/student for training is reduced. The estimated benefits of this investment in training are that:

1. the number of persons receiving training will be three (3) times greater per year than the total number trained in all the training interventions to date.

2. the length of training per trainee will be the equivalent of one (1) month/year as compared to one (1) week/year previously.

3. Class size will be approximately 10 trainees/class allowing for personalized, practical training.

4. A cadre of trainers will be developed, thus expanding the breadth of training and further institutionalizing training as a part of the organizational structure.

5. Providing mid-level and upper management with training in current techniques of supervision, personnel, financial, problem-solving and other aspects of management.

6. A more knowledgeable workforce which will perform more efficiently and be a better position to sustain the project once donor participation ceases.

Summary of Annual Training Costs
in US $ (000)

Year	1	2	3
AUC	30	60	90
Staff	920	920	920
Audio-visual	-	-	-
Copiers	-	-	-
Transportation	-	45	45
Supplies	25	25	25
Computers		10	10
Terminals		10	10
Facility		20	
	975	1,090	1,120

N.B.

Start-up capital costs of $ 1,625,000 are included in Chapter 5 p. 35

Appendix F

PRESENTATION OF WORKSHOPS REPORT

APPENDIX F

PRESENTATION OF WORKSHOPS REPORT

As part of the evaluation, two workshops were held to discuss their findings. These were held in the conference suite at the President Hotel, Zamalek, Cairo on the 3rd and 4th of October 1988.

The first of these on the 3rd of October was presented to 33 participants made up as follows:

USAID	4
Vice Chairman of GOSD	1
Middle Managers of GOSD	14
WO IVA Contract Staff	8
WASH Team and Support	5
EQI	1
Total	**33**

The workshop first dealt with training. After a short introduction on training methods the participants divided into groups to list the principal training problems of GOSD and their perceived solutions.

This produced a consolidated list of problems and solutions as follows:

- No commitment to training by management and trainees i.e. lack of motivation.
- No continuity of training, not coordinated with actual work of trainees, no follow up or feed back.
- Insufficient budget for training, hence lack of materials and equipment
- More full time, high quality trainers required.
- More on the job training
- Adequate specialized training center needed, fully equipped.

- Not enough types of courses covering all departments.
- Level of training not high enough to meet real needs of trainees.
- Training in new AMBRIC works needed on O & M before taken over.
- Difficult to apply acquired skills in the workplace due to lack of tools and spare parts.
- Problems relating to training illiterates.
- Management training required.
- Training in English required.
- Timing of training to suit shift times etc.
- Training incentives required.

In addition to these problems, the following suggestions were also made:

- All managers should be surveyed for their suggested training needs of them and their staff.
- Workshop required for the overhaul of diesel engines.
- Stores handling needs computerization.
- General need for computer based systems.
- New pump repair workshop required.

An attempt was then made to see which problems could properly be assisted by WO IVA.

The training session concluded with a slide presentation on the principal conclusions and recommendations of the evaluation study. The slide presentation continued with the achievements and remaining problems of O & M support followed by a presentation of the principal conclusions and recommendations of the evaluation study.

Participants were invited to select the most important points either in or out of the evaluation to be conveyed to the senior staff workshop on the following day by the Deputy Chairman General Nasser. These points were:

1. The need for an adequate training budget.
2. The need for a comprehensive set of training programs at all levels.
3. Training in O & M of the new works being built by AMBRIC before they came on stream.

4. The need for an adequate fully equipped training center.
5. The need for the upgrading of sewer cleaning equipment.

At the conclusion, participants completed an evaluation form for the workshop with the results shown on the consolidated form.

The second workshop, at the same venue, on October 4th was held to present the main conclusions of the evaluation report to senior staff of GOSD, AMBRIC and other governmental officials and USAID staff as follows:

	USAID	3
	Chairman General Sewelam of GOSD	1
	Senior staff of GOSD	6
	Senior staff of AMBRIC	3
(Others list):	Director of CWO	1
	Head of Projects Division CWO	1
	Under-secretary for Planning Affairs, Cairo Governorate	1
	Director of EQI	1
	Evaluation team support	5
	Total	**22**

The recommendations on training, O & M support and institutional support provoked a lively and useful discussion.

At the conclusion Mike Gould, Chief of Division of USAID, indicated that a copy of the report, when received would be handed over to AMBRIC WO IVA staff to see which recommendations would fall within the scope of assistance under WO IVA.

General Sewelam thanked all those that were assisting GOSD in the major task of meeting the challenge presented by the carrying out of the effective drainage of Cairo.

SUMMARY OF REPLIES

USAID WORKSHOP EVALUATION FORM

OCTOBER 1988

1. How successful has the workshop been ? *(Please tick) /*

Very successful	11
Reasonably successful	10
Not very	2

2. In What ways could it have been improved ?

Advance notice of Questions and Agenda.

Aims could have been clearer.

Not long enough. Better visual aids and room layout.

Participants informed about WO IVA in advance.

Not all sectors of GOSD covered.

Report not an end in itself. Hope it will be implemented

3. How do you rate the sessions ? *(Please tick) /*

PERFORMANCE MONITORING AND TRAINING:

Low	2,5
Medium	8,5
High	10

IMPACT ON O & M:

Low 2

Medium 10

High 8

INSTITUTIONAL SUPPORT OF O & M:

Low 3

Medium 10

High 5

N.B. Time ran out on this session

4. Any other comments ?

Would like copy of results, report and slides.

Treated effluent should be used for irrigation.

There should be incentives for good moral.

Should have been only 1 group dynamics session.

Training emphasis on:

- Training by Egyptians.
- Practical training.
- Practical equipment.
- Handbooks in Arabic and English.
- Safety training.
- Training of heads of stations for them to train their staffs.
- Specialized sewer cleaning training.
- Introduction training.

Meetings of this sort should be more frequent.

Better provision of spare parts.

EXECUTIVE SUMMARY
IN ARABIC

تنظيمية البرنامج

إن الأداء الفعال للهيئة العامة لمرفق الصرف الصحي تعترضه محدوديات وصعوبات نخص بالذكر منها عدم توافر الاستقلال الأداري وعدم مقدرتها على تأمين ما تتطلبه من احتياجات مالية .

- يجب أن تبذل الهيئة العامة للصرف الصحي المساعي لتحقيق استقلالها وهذا يمكن أن يتم عن طريق تحويلها الى شركة قطاع عام مما يجعلها قادرة على تأمين ما تحتاجه من الأموال .
- يجب أن يكون هناك تعامل مباشر بين الهيئة ووكالة التنمية الأمريكية في موضوعات التشغيل والصيانة .

الميزانية المعتمدة غير كافية و بالرغم من ذلك لا يتم صرفها بالكامل ، كما وأن تدبير المكون الأجنبي لاستيراد قطع الغيار تقابله صعوبات كثيرة .

- يجب ان تصرف الهيئة العامة للصرف الصحي الاعتمادات المخصصة لها بالكامل .
- الاستفادة بالخبرات المتوفرة في المكتب الاستشاري في اعداد عرض الميزانية لوزارة المالية .
- اخطار الهيئة مسبقاً بتفصيل النقد الأجنبي المخصص لها حتى يمكنها طلب قطع الغيار وغيرها من الاحتياجات في الوقت المناسب .

الأفراد

أعداد العمالة المتوفرة في الهيئة كبيرة بصفة عامة ، لكن يوجد نقص في بعض المجالات ، لذا يلزم :

- تدريب أفراد الأدارة العليا تدريباً إدارياً مناسباً .
- تعتبر الأعداد الموجودة حالياً الحد الأقصى المطلوب للعمالة .
- استخدام نظم المعاشات المبكرة للعاملين (سن ٥٥ عاماً) لتقليل اعداد العاملين .

التكاليف التقديرية

وموضح في التقرير التكاليف التقديرية للتدريب الأضافي المطلوب ولمنشآت التدريب وذلك لدعم أعمال الصيانة والتشغيل للمعدات والمخازن الجديدة ، بالأضافة الى مبلغ ضئيل لدعم الأعمال التنظيمية و يبلغ إجمالي الاعتمادات المقدرة بمبلغ ٨٫٠٨٠٫٠٠٠ دولار مع تكلفة سنوية تقدر بمبلغ ٢٨٥٫٠٠٠ دولار (باستثناء التدريب) من اعتمادات أمر التشغيل رقم (٤أ) وحتى تستطيع الهيئة العامة للصرف الصحي قادرة على تمويل ذاتها .

(ملاحظة ، تكلفة التدريب السنوية لوكالة التنمية الأمريكية موضحة في نهاية ملحق أي) .

التدريب ومراقبة الأداء

لقد كانت العوامل الأساسية لمراقبة الأداء و برنامج التدريب من احتياجات التقييم والتدريب الأولية (حيث أخذ بعين الاعتبار انخفاض او عدم وجود مستويات التعليم) والتي يتم تدريسها باللغة العربية بواسطة مهندسي الهيئة العامة للصرف الصحي ، والتي شملت أيضاً العديد من الخصائص البصرية و برامج الصيانة الوقائية والتدقيق . وقد تمت عمليات تقييم الأداء بانتظام بواسطة مستشارين امريكيين و بريطانيين بالأضافة الى موظفي الهيئة العامة للصرف الصحي . وقد أدى ذلك الى ايجاد جو من المنافسة الصحيحية والخلافة بين محطات الضخ للتوصل الى افضل نتيجة ممكنة .

اهتمامات ادارة الهيئة العامة للصرف الصحي

إن الأدارة الحالية تواقة الى توسيع نطاق التدريب بالأضافة الى التجهيز الصحيح لمركز تدريب جديد في أقرب وقت ممكن .

صعوبات التنفيذ وحلول للبرنامج

بحلول سنة ١٩٩١ سيزيد حجم المياه النقية المستخدمة في القاهرة عن سعة نظم المجاري الحالية والحديثة مما يستوجب ان يتم التشغيل بفعالية كبيرة . إذ أن تأهيل مشروع مجاري القاهرة (ا) لمحطات الضخ حيث تبعه التدريب والصيانة الوقائية وتقييمات منتظمة خلال ١٩٨٥ ــ ١٩٨٧ ، كل ذلك كان له تأثيراً قوياً . لكن فترة التوقف لمدة ١٨ شهراً قد أدت الى خسارة بعض الأرباح ، و ينطبق ذلك أيضاً على محطات الضخ وتنظيف المجاري . ولأعادة البرنامج يجب ان يتم التالي :

- إعادة استخدام قوائم وكشوف التقييم .
- تدريب العاملين بقسم المتابعة والتقييم بما يكفل قيام هذا القسم بواجباته وتحمل مسؤوليته .
- عمل مسابقات سنوية بين المحطات لتحديد أفضل المحطات فيما يتعلق بالطوافم والأداء .
- انشاء ورشة جديدة لاصلاح وصيانة المضخات كأسبقية أولى وعاجلة .
- وضع أسلوب أفضل لطلب وللحصول على قطع الغيار .
- ومن الضروري جداً تأمين ، سياسة أمنية بالأضافة الى المعدات والتدريب .
- توعية الجماهير لتجنب الاستخدام السيء لشبكات الصرف الصحي .
- من الضروري إيجاد نظم أفضل للبناء وذلك لمنع إنشاء مباني بدون مجاري او إنشاء مباني فوق غرف التفتيش الموجودة تحت الأرض .
- إعداد خرائط سليمة لخطوط الصرف الصحي .

ملخص تنفيذي

مقدمة

صمم مشروع مجاري القاهرة (١) لتحسين اداء نظام المجاري في القاهرة ، ولتصميم توسعها ولتحسين تصريف المياه القذرة في المناطق التي لا يوجد فيها مجاري و يشتمل على :

- اعادة تأهيل نظام التجميع الأساسي للقاهرة .
- تدريب الموظفين في أعمال التشغيل والصيانة .
- مراجعة وتطوير خطط توسيع النظام لسنة ٢٠٠٠ ، وقد توسع ذلك ليشمل اعادة تأهيل النظام الفرعي ، والتوسيع في الضفة الغربية من القاهرة ، وتصميم كل من نظام الضفة الغربية والضفة الشرقية ، والتداخل في المناطق التي لا يوجد فيها مجاري وقسم الخدمات الاستشارية للتدريب والادارة .

وقد قام نظام مجاري القاهرة (١) بتحسين التشغيل والصيانة الحقيقية لنظام القاهرة ، وتواجه مضخات المحطات وعمليات تنظيف المجاري بعض العجز لكنها اكثر فعالية حالياً . و يعود سبب التحسن هذا الى المعدات الحديثة والتدريب والتدقيق وتقييم الصيانة المانعة والنصح الاداري .

وقد نتج ارتداد بسبب توقف مجاري القاهرة (١) والتأخير في أمر التشغيل (٤أ) و يوفر أمر التشغيل (٤أ) الفرصة لاسترجاع ما تم خسارته في نطاق مدعوم من قبل الهيئة العامة للصرف الصحي مع علاقات ارتباط محددة .

محطة الضخ ومراقبة اداء تنظيف المجاري والتدريب على التشغيل والصيانة .

تأثير التدريب

وقد كان التدريب أحد العوامل التي نتج عنها تحسن الأداء في محطات الضخ وتنظيف المجاري . والدليل على ذلك هو التدقيق في مراقبة الأداء بالأضافة الى نظام التصنيف . وقد ظهر ذلك أيضاً من خلال انخفاض عدد حالات الطفح بمعدل الثلثين كما هو مشار اليه في تقييم مكتب نوعية البيئة الدولي في نهاية سنة ١٩٨٧ . وقد تأثرت فعالية التدريب تأثيراً سلبياً نتيجة لفترة التوقف بين نهاية مشروع مجاري القاهرة (١) والبدء في تنفيذ أمر التشغيل (٤أ) ومن المعلوم ان التدريب يجب ان يكون له صفة الاستمرار مع كفالة جهات الادارة لتنفيذه . والمطلوب و بشكل ضروري زيادة في التدريب ، إذ أنه لا يوجد إلا ٦٠٠ شخص مدرب فقط (وهذه نسبة ٦ أو ٧ بالمئة من القوى العاملة) .

وهناك حاجة ماسة لمصادر التدريب وخاصة فيما يتعلق بالمعدات والتدريب العملي . وهناك أيضاً حاجة قوية للتدريب الأداري ، ويجب أن يتم تطوير برنامج دراسات عليا في الأدارة بالأضافة الى استخدام المواد التي تدرس حالياً في الجامعة الأمريكية في القاهرة بالأضافة الى الأماكن الأخرى التي تتوفر فيها تلك المواد .

ويجب توسيع منشآت التدريب في محطة السيفون بالأضافة الى المنشآت المقترحة في زنين والأميرية .