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Operation and maintenance services for Dar es Salaam City Sewerage and Sanitation

INTRODUCTION

This paper is one of a series on a complex and involved project. Others will deal with the main Civil Engineering works and provision of facilities. My main concern is the establishment of a new Department of the Dar es Salaam City Council, the Sewerage and Sanitation Department (DSSD), which will take over and run efficiently all the sewerage and sanitation facilities of the city, so that the city will continue to benefit from the project.

Without an effective operation and maintenance organisation, the benefits of the project would be shortlived.

BACKGROUND

The project is the first stage of a long term programme to improve sewerage and sanitation in Dar es Salaam.

The original proposal was to concentrate on sewerage - a conventional water-borne waste disposal system, but this, both now and for many years to come, could serve only a small proportion of the city's population.

The city centre system, which was constructed between 1956 and 1959, discharges through an ocean outfall, just North of the harbour entrance. Nine other separate systems have been installed for residential, institutional and industrial developments. In each of these, treatment is by waste stabilisation ponds.

The condition of the existing systems is exceptionally bad. The ocean outfall pipes are damaged and broken in several places. Only one of the waste stabilisation ponds is still operating, and of the 17 pumping stations, only one is usable, and that only partially. Some of the pumping stations have been out of use for several years. Some major sewers are completely blocked and septic conditions have caused serious corrosion and collapse.

The existing sewerage system could serve only about 12% of the population. About 10% have septic tanks, and 78% use pit latrines or other methods. There were about 8,400 septic tanks and 60,000 latrines in 1979, when the population was estimated at 932,000. It has since increased considerably.

The basic cause of the state of the existing sewerage system is lack of maintenance, especially in the period from 1974 (when the City Council was abolished) to 1978, (when it was re-established.)

The implementation period and scale of the project have been changed considerably during project planning. A key decision was made to give new sewerage a low priority and restrict this to areas where on-plot sanitation facilities could not be used. Pit latrines have very much lower construction and operation costs than sewerage, so many more can be served for a given cost. On-plot sanitation - pit latrines and septic tanks - provides similar health benefits to sewerage, when properly designed and constructed. The facilities to serve them, (mainly pit emptying and sludge disposal), must be adequate, and people made aware of proper use and cleanliness.

DEFINITION OF PROJECT ELEMENTS

The project comprises five parts, for all of which Ministry of Lands, Natural Resources and Tourism (ARDHI) is responsible, except for C 1, C 5, E 1 and E 3.

Part A Sewerage Rehabilitation and Upgrading

1. Rehabilitation and part replacement of about 130 km of sewers and pumping mains.
2. Repair of sea outfall and construction of screen house etc.
3. Rehabilitation of 17 pumping stations.
4. Repair and improvement of waste stabilisation ponds.

5. Construction of about 600 new sewer connections.
6. Equipment, vehicles etc. for operation and maintenance.

Part B Low Cost Sanitation (LCS)
1. Construction and upgrading of about 3,600 pit latrines.
2. Construction of dumping stations for pit emptying vehicles.
3. Rehabilitation and purchase of new pit emptying vehicles.

Part C Dar es Salaam Sewerage and Sanitation Department (DSSD)
1.* Establishment of DSSD and training of its staff.
2. Construct Headquarters for DSSD, and temporary offices.
3. Construct DSSD workshop and storage facilities.
4. Equipment for DSSD workshop
5.* Establish a billing, collection and accounting system.
6. Upgrade three existing maintenance depots.
7. C nstruct a field office for the Low Cost sanitation Programme.
(* only these two are defined as DCC/DSSD responsibilites)

Part D Studies
1. Preparation of studies including
   (i) a system of charges for sewerage
   (ii) solid waste management and
   (iii) pollution.
2. Review of legislation.
3. Survey of existing connections to sewerage, water supply and electricity.
4. Design for future sewerage.

Part E National Urban Water Authority (NUWA) ARDHI, Tanzania Electricity Supply Company (TANESCO)
1. Technical assistance to NUWA (NUWA responsible)
2. Strengthening ARDHI's Public Health Education and sanitation services.
3. Study of proposals to increase TANESCO's computer capacity for use for DSSD billing, collection and accounting procedures. (TANESCO responsible)

FINANCE AND CONTROL OF PROJECT

(The costs below are July 1982 estimates) The project has been financed mainly through a World Bank, I.D.A. Credit of 20.6 million S.D.R.s (Special Drawing Rights - approximately equal to 1 dollar U.S.) which covers about 87% of the total cost of the sewerage and sanitation component, and 85% of the technical assistance. The balance of project funds would come from Tanzanian Government contribution and internal cash generation.

The proposed I.D.A. financing is equivalent to 100% of the foreign exchange cost and 74% of the local cost, before taxes.

Under agreements between the I.D.A., the Government of Tanzania, and Dar es Salaam City Council, the works, facilities and equipment constructed or acquired under parts A,B and C. of the project, are to be transferred to DCC (effectively DSSD), who then have the responsibility of repaying the cost to the Government, with interest. The Government, in turn, repay the I.D.A.

The project is being carried out jointly by ARDHI and DCC, with ARDHI having prime responsibility. The project Implementation Unit, headed by a Project Manager, has been established in ARDHI. This Unit is responsible for control of design work and contracts for all major project construction, supplies and equipment. However, it is proposed to transfer responsibility for the construction of pit latrines to DCC/DSSD.

THE ROLE OF DSSD

The establishment of DSSD was approved by the City Council, Prime Minister's Office and Treasury in May 1982. DSSD is to operate on semi-commercial lines. It is a self-contained semi-autonomous department, reporting to the City Director, incorporating all the services and functions, including administration, personnel, finance and accounting, necessary to carry on all the sewerage and sanitation operations throughout Dar es Salaam. DSSD must generate, mainly from charges, sufficient funds, not only to operate and maintain the existing facilities and those provided under the project, but also to repay (over 25 years), the capital value, with interest, of the assets transferred to it.

Previously, responsibility for sewerage and sanitation within Dar City Council was divided between the City Treasurer, City Engineer, Chief Health Officer and Chief Workshop Mechanic.

The Primary Operations of DSSD will be:-
1. Sewer maintenance and repair
2. Pumping station maintenance and repair
3. V.I.P. latrine construction
4. Pit and septic tank emptying service

These activities require Secondary Operations
5. Vehicle and plant service and repair

6. Depot and stores operation.

and to support this work Financial and Administrative organisation covering:-
7. Finance and Budget control
8. Revenue collection (Sewerage and pit emptying charges etc.)
9. Collection of V.I.P. latrine construction repayments
10. Manpower and training
11. Health Education
12. Vetting and approval of proposed sewerage for development.

DSSD DEVELOPMENT

As part of the technical assistance component of the project, a team of experts has been provided to staff key positions in DSSD, train couterparts and introduce the management and financial measures necessary.
The team comprises:-
1. Head of Department (myself) who reports to the City Director.
2. Finance Officer
3. Senior Training Officer
4. Senior Sewerage Engineer
5. Senior Sanitation Engineer
6. Senior Transport Engineer
7. Health Education Officer

An examination of the elements of DSSD's role, given above, shows that DSSD cannot fully take up that role until ARDHI, their Consulting Engineers, Contractors and Suppliers, have all completed their part, and operating funds have been provided.

DSSD activities are, therefore, a gradual build up in a multitude of areas, passing through stages of investigation, planning preparation, recruitment and training, until fully operational.

One of the first matters to be put in hand was the preparation of a departmental staffing proposal. This involved the examination of the nature and extent of all the department's future activities, the preparation of a proposed organisation chart and job specifications.

Each operation was then related to the provision of equipment and facilities as then programmed. This enabled a manpower forecast to be prepared, related to a timescale. This gave the data for preparation of a budget, and outline training programme.

As an illustration, we can examine in more detail, one of the more straightforward Primary Operations of DSSD, the pit and septic tank emptying service.

Some of the factors involved in its introduction and build up are:-
1. Repair and rehabilitation of Pit Emptying vehicles (PEVs)
2. Purchase of additional PEVs.
3. Provision of repair and maintenance facilities.
4. Provision of fuel facilities
5. Construction of suitable disposal and treatment facilities.
6. Driver and operator selection and training.
7. Establishment of charge collection (in advance) arrangements, office staffing, levels of charge etc.
8. Vehicle operation schedules, logs and controls.
9. Supporting cash handling, clerical, employee pay and other financial and administrative procedures.

Most of the investigations, planning and preparation stages for all the Primary Operations, Secondary (service) operations and Financial and Administrative works are now complete.

The recruitment of staff depends on receipt of funds. These are now about to be provided, it is believed. Training and the take-on of responsibility for operations will follow.

PROGRESS

This paper is written from the point of view of 'the end of the chain'. DSSD is the recipient of all the new and rehabilitated works, plant and equipment, when these are completed or provided by others. It will also receive most of the bill.

Consequently, all delays, in almost any part of the project, affect the time when DSSD can take up fully its role of operation and maintenance, and its programme of work. This being so, our concern at present tends to be more with the problems and delays, than the successes of the project.

The format of the project is an unusually complex one, with construction, repair, procurement and training activities, covering a wide range of work and numerous contracts. It involves many organisations, -primarily ARDHI, DCC and DSSD, employing Consulting Engineers, Architects and

Contractors, with the World Bank, Ministry of Finance, and Prime Minister's Office, (responsible for Local Government) all involved.

The many and complicated procedures for securing tenders and money, in accordance with World Bank and Government requirements have led to severe delays in many parts of the project, and the relative timing of many of the project's activities has been adversely affected. However, most tenders have now been let. Work on site and delivery of vehicles and equipment has commenced.

The first of the DSSD key staff arrived in September 1983, having been originally programmed for April 1983, but most of the procurement and construction contracts are 12 or 18 months behind original schedule. Sewer rehabilitation is just starting, (originally due August 1983) and vehicles for ARDHI and DSSD just arriving were planned for March to August 1983. Some programmes are even further delayed. The new workshops for DSSD are not now expected to be completed until some months after the Transport Manager's contract expires. At the time of writing this paper, DSSD still has no budget funds, and so no employees. It has only just received project transport, some 16 months after the team arrived.

However, a scheme for construction of up to 3,500 Ventilated Improved Pit Latrines households in the Temeke area, on a repayment basis has been approved by DCC, and construction of 100 demonstration V.I.P. latrines is about 75% completed, being done under DSSD supervision as a pilot scheme. Staffing and organisation proposals, a budget, job descriptions and training programmes for DSSD staff have been prepared. An active sanitation health education programme has been prepared and successfully launched.

EXPERIENCE GAINED AND SUGGESTIONS

It is apparent at this stage in the project, that there are substantial benefits to be gained from close co-ordination and co-operation in all activities of the many different bodies involved in a complex project such as this.

In order to achieve maximum benefit at least cost, it is essential that a clear understanding is gained by all concerned as to the role of each organisation, and the effects their decisions, actions and expenditure have on the project as a whole, and on the programmes and responsibilities of the other participants.

Project planning and control must take into account all the procedural, technical and financial requirements of all the bodies involved, so that these may be dealt with at the right time, and with a minimum of delay and cost.

One suitable technique for planning the relative sequence and timing of activities is 'Network Analysis'. The drawing up of a network diagram, showing all the activities and their relationship, taken together with the estimated times, will give information which can be analysed to identify the critical activites.

Given this information, all involved in the project can see where and how delays affect the project as a whole, and where more time can be taken without adverse effect.

Also essential, is the regular provision of full and up to date financial information, including cash flow for the remainder of the project. For example, when planning training, it is necessary to know, not only the physical stage and timing of works, but also the resources and finance available or already committed. Only with this knowledge can realistic plans, capable of execution, be made.

Where responsibility for different aspects lies with various bodies, such project planning can only take place by careful co-ordination of information from all parties, and full and open co-operation. The more complex the project, the greater the benefits to be derived from such planning.

Information flow is more easily acheived when a minimum number of organisations are involved. For very large and complex projects, a careful study of the best form of organisation to carry out the work, is desirable, before the project commences. In some cases, a separate responsible body, with adequate authority and funds, may well be the most efficient arrangement.

The views and opinions expressed in the paper are the personal views of the author, and are not to be taken as the views of any organisation.
