

AFR TZA/S 304/91

REHABILITATION OF DAR ES SALAAM WATER SUPPLY

FOLLOW-UP REPORT 1995

Project data

Region:	Africa
Country:	United Republic of Tanzania
Sector / Subsector:	Public Utilities/Water supply
Code No:	AFR TZA/S 304/91
Type:	Feasibility Study
Counterpart Agency:	National Urban Water Authority
Fiscal Year Completed:	1991
Consultants:	Tokyo Engineering Co., Ltd Pacific Consultants International
Expenditure:	351,662 (¥'000)
Present Status:	Promoting

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Project site map / location

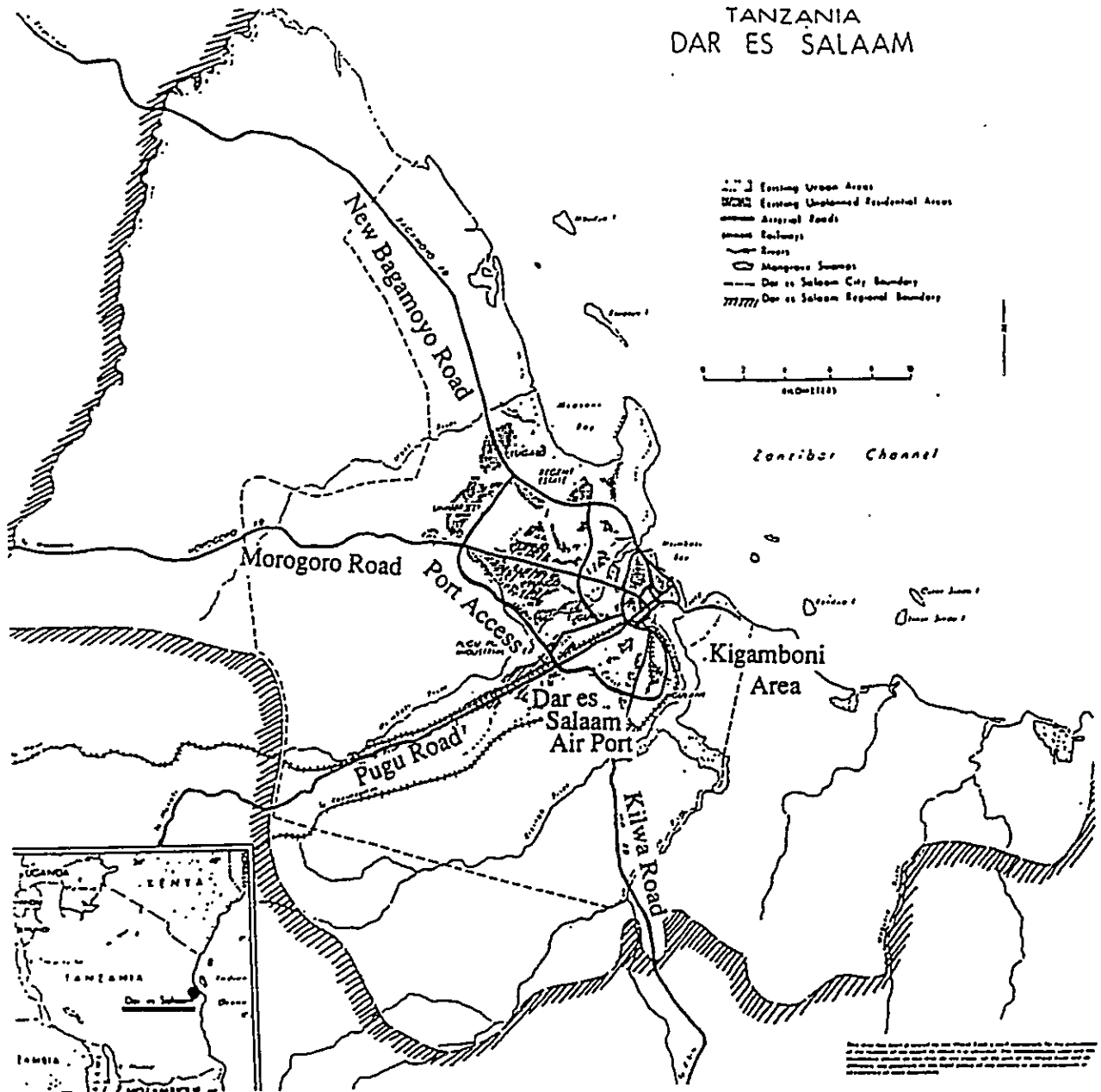


Table of Contents

1	EXECUTIVE SUMMARY	
	Summary of survey results.....	1
	Conclusions.....	1
	Recommendations for JICA.....	2
	Dissemination and following action.....	2
2	RESULTS OF SURVEY: PROJECT DESIGN	
	Identification & outline of project rationale.....	3
	Short description of project.....	3
	Detailed design.....	4
	Funding.....	4
	Critique of project design.....	5
3	RESULTS OF SURVEY: PROJECT IMPLEMENTATION	
	Implementation and monitoring.....	6
	Development to date.....	6
	Processes.....	7
	Impacts.....	7
	Sustainability.....	7
4	RESULTS OF SURVEY: CONCLUSIONS	
	General comments on development.....	9
	Specific comments on JICA's role.....	10
	Specific recommendations for project.....	10
	Requests for further surveys.....	10
	ANNEXES	
A	Interview.....	11
B	Photographs of project.....	14
C	Terms of reference and purpose of survey.....	16
D	Methodology & chronological itinerary.....	18
E	References & reports used in survey.....	19



1 Executive Summary

Summary of survey results

Despite the efforts of the National Urban Water Authority (NUWA), the Dar es Salaam water supply system is presently in a very poor condition and deteriorating rapidly; its complete rehabilitation must be considered an essential priority.

It is also very apparent that the rehabilitation of the water supply can not be treated in isolation to the water resource development problem. Action must also be taken to resolve this issue at the earliest possible opportunity.

A number of issues were identified which have contributed to the delay in implementation of the rehabilitation programme.

- With significant but limited donor funds available to it, the Tanzanian Government has had to frequently prioritise its applications for assistance in development projects. In this case the road improvement and maintenance programme was given priority over the rehabilitation of the water supply and a logical sequence of development was lost.
- The rehabilitation of the water supply has been largely neglected by alternative donors for the last five years partly as a result of donors reluctance to use other agencies' feasibility studies as a basis for funding.

The delay and the favouring of the road improvement programme over the water supply rehabilitation now means that any major work on the water supply (or in fact any of the services) will require significant sections of the improved roads to be excavated and resurfaced.

Conclusions

The rehabilitation of the Dar es Salaam water supply must be considered as a very high priority by the Tanzanian Government and, if requested, donors. Further deterioration in the supply and quality of water to the city will rapidly lead to potentially serious health and quality of life problems. These in turn will have a significant impact on the economic well-being of the city.

JICA supported feasibility studies into both the rehabilitation of the water supply and the road improvement and maintenance programme. The survey study teams overlapped and must have been aware of the potential conflict that would arise if one project had to be considered over another.

Improved planning and policy coordination at a high level for the operational activities between the various agencies (eg: Dar es Salaam City Council, NUWA, Planning Commission, and JICA) would probably not have allowed this situation.

Recommendations for JICA

Although JICA may not affect recipient government's development planning policies or implementation strategies, the lack of co-ordination in separate feasibility studies has led to the probable unnecessary waste of donor resources. Where planning conflict such as this occurs, and significant sums of its aid funding is involved, JICA must make an effort to ensure there is an appropriate decision-making process.

JICA should continue to examine ways it can assist NUWA to rehabilitate the Dar es Salaam water supply. If the programme is too expensive for one donor to support, then NUWA should be encouraged and supported in its efforts to convene a donor conference to ensure that the rehabilitation takes place.

Dissemination and following action

Apart from the JICA UK Office, it is anticipated that this report will be distributed among the relevant Tanzanian Government authorities associated with the project: NUWA, Dar es Salaam City Council, and the Ministry of Water.

2 Results of survey: Project Design

Identification and outline of project rationale

In response to a request from the Tanzanian Government, the Japanese Government supported a feasibility study into the rehabilitation of the Dar es Salaam water supply. The study took 25 months between June 1988 and July 1991.

The feasibility study appraised the potential to achieve:

- the adequate supply of potable water to Dar es Salaam;
- increasing the effective water supply and, consequently, the consumers willingness to pay;
- an autonomous NUWA;
- overall improvement in the Dar es Salaam water supply.

Short description of project

The survey identified essential works required to satisfactorily improve the Dar es Salaam water supply.

1 Leakage control measures.

- Installation of 15,000 metering units
- Introduction of leakage control measures
- Pipe cleaning:
 - air scouring of 417 km
 - scraping and lining of 213 km

2 Contractual work.

- leakage control in the transmission system
- leakage control in the distribution system
- connection of pipes
- primary main pipe laying
- secondary main pipe laying
- middle zone facilities including back-pressure tank and supply pipes
- rehabilitation and expansion of Mtoni and Lower Ruvu treatment plants

Detailed design

The detailed design survey has yet to be carried out.

Funding

In 1991, the total cost for the rehabilitation programme was estimated at US\$ 27.67 million or 3,044,000 (¥'000).

The first request to the Japanese Government for grant aid of 600,000 (¥'000) was submitted in 1991. This was to cover supply of equipment for leakage control, pipe-cleaning, and metering. The Tanzanian government was to meet other costs (ie: installation and labour costs). NUWA believe that the grant was rejected on the grounds of high cost. In addition, from a political perspective, the Government of Japan were already involved in the high-profile Dar es Salaam road improvement and maintenance programme.

A second request for grant aid assistance was submitted in 1993. This comprised a re-prioritised water supply rehabilitation programme. The original proposal had been modified to include an increased number of counterparts to train in Japan to maximise the potential for skills and technology transfer.

A decision on this application was delayed while the African Development Bank (ADB) examined the possibility of their involvement in Dar es Salaam as part of a programme to assist in the rehabilitation of public utilities in 8 major municipalities of Tanzania. Later, due to the very high cost of such a programme, the ADB downgraded their programme to cover water supply only. The ADB feasibility report for the Dar es Salaam water supply was produced in January 1995, and the Tanzanian Government is now awaiting a response from them.

In the interim, the Japanese Embassy have continued to discuss possible Japanese Government assistance with the Ministry of Finance and NUWA have again submitted an application for grant aid for part assistance in a programme to complement the ADB initiative.

NUWA have also taken the initiative to contact a number of parties, including JICA, ADB, and the IRBD, about the possibility of convening a donors conference.

Critique of project design

One significant outcome of continued programme reprioritisation is that donors are presently being asked to assist in the rehabilitation of the water supply in the low-density residential areas. While the logistical environment and the perceived ability to pay for water may support this strategy, the areas affected are not the most affected by poor water supply and attendant health problems, and cost per capita may be relatively high.

As a result, and if the ADB initiative does not proceed, the high-density suburbs of Dar es Salaam may continue to suffer from illegal connections, leakages, and health problems associated with poor sanitation.

3 Results of survey: Project Implementation

Implementation and monitoring

The feasibility study cost 351,000 (Y'000) or US\$3.2 million in 1991. Five years after the completion of the feasibility study, the rehabilitation programme has yet to be implemented.

Development to date

Only emergency repairs have been carried out since the production of the report in 1991. Where possible, NUWA has acted on illegal connections and arrears but billing procedures are mostly manual for the 70,000 registered consumers, of whom only a small percentage pay the bills. Consumers prefer to pay the fixed rate tariff, with only 1% metered and many (perhaps half) of the meters are broken. Only the larger commercial users are regularly billed.

The Lower Ruvu and Mtoni treatment plants have had essential repairs (eg: a new intake pump at Lower Ruvu). Italian government assistance renovated the Upper Ruvu treatment plant in 1990. However, due to a change in government in Italy, assistance was withdrawn before Phase II (the construction of new mains to Dar Es Salaam) could be carried out.

In 1995 the African Development Bank (ADB) sponsored another feasibility report into the rehabilitation of Dar es Salaam's water supply. This report included a review of all previous studies into both the water supply and source problems. This study drew heavily on the JICA report and, in general, was in agreement with the 1991 report. The new study includes new storage tanks, the expansion of the Lower Ruvu water treatment plant, and a new main from the treatment plants to the city storage tanks.

The ADB report reiterated the need to resolve the development of a sustainable water resource for Dar es Salaam at the earliest opportunity.

The ADB report also surveyed and reported on the willingness to pay for water in Dar es Salaam. It concluded that consumers were willing to pay for an improved water supply which would generate a significant level of income and internal cost-recovery for NUWA. To some extent, this is borne out by the market for water

in areas with no mains supply: residents of the high-density areas currently pay up to Tsh. 600 for 20 litres of water, however, they have no choice. On the basis of experience, NUWA officials consider that people pay for a scarce resource and once the water is available on tap people will once again take it for granted.

Processes

After the Tanzanian Government requested the Japanese Government to carry out the feasibility study, the JICA survey team spent 25 months appraising the status of the Dar es Salaam water supply. Counterparts were assigned to the team and the study involved visits to treatment plants, on the ground surveys of the pipework, and a full appraisal of the financial and administrative structure of NUWA.

Impacts

The delay in implementation has led to a significantly deteriorated state of the water supply in 1995. There has been an increase in leakages, illegal connections and greater numbers of arrears and non-payments. Through very careful management by NUWA staff, the Lower Ruvu and Mtoni treatment stations continue to supply water to Dar es Salaam, but with considerable difficulty and water quality is suffering. The continued problem in raising revenue has meant that much of the chemical treatment of the water at all three plants has had to be limited or sacrificed. Over 60% of NUWA's operating costs are derived from the cost of chemicals required for treatment (which require foreign exchange) and electricity for pumping.

Implementation of the rehabilitation programme at the time of the study would have increased the potable water available within the system from 193,400 m³/day in 1990 to 245,900 m³/day in 1995.

Sustainability

Financial resources to cover the capital, operations, and maintenance costs for this project are intended to come from water charges and the recovery of money from bad debts and illegal connections. Water charges will be raised under a revised

tariff system which will include a one-off 68% increase and subsequent inflation-indexed annual increases. This highly-political strategy will not be easy to achieve. It is calculated by JICA that an internal rate of return of 7.2% could be achieved if administrative improvements (including billing procedures and adjusted tariffs) and reduction in the number of illegal connections is 50% effective. It is currently expected that these improvements would be 70% effective.

This revised tariff regime is likely to meet resistance from users at the lower end of the socio-economic scale and, as such, there must still remain a question over the willingness-to-pay assumption in both the JICA and ADB reports. Under present conditions many domestic users are over 5 months in arrears and NUWA does not have resources to pursue these users for payment. In some cases this may be a reluctance to pay for a poor service, but in many cases it is also due to insufficient funds.

There is also a considerable amount of illegal connections in the commercial and industrial sector. It is essential that a rigorous policing of illegal connections be implemented via the installation of meters and monitoring, and an appropriate penalty structure is introduced and enforced.

The general level of skills and ability of staff within NUWA appears to be high, and with appropriate counterpart training and other forms of on the job training NUWA should be able to maintain the water supply system from a technical viewpoint. The key management issue centres around the ability of NUWA to raise and disburse its revenue appropriately.

The greatest problem that will face NUWA after the completion of the rehabilitation of the water supply is its ability to meet the increase in demand. As the population increases (currently at a rate of over 4% p.a. in Dar es Salaam) and the supply improves, any short term increase in supply through improved conveyance and distribution will be absorbed. If there is a failure to resolve the long-term water resource development and supply for Dar es Salaam, NUWA will then once again have a great problem maintaining the willingness to pay of its customers who will be subject to rationing.

4 Results of survey: Conclusions

General comments on development

The rehabilitation of the Dar es Salaam water supply is essential. It is presently in very poor condition and deteriorating rapidly. NUWA have tried to deploy their scarce resources in a rational and efficient manner to maintain a failing system. Despite their efforts the situation is now serious and without external support NUWA will soon be unable to operate. Large scale leakage and illegal connections, combined with a crumbling administrative and billing structure means that each year the situation becomes more difficult for NUWA to operate.

In the past the decision making process has been affected by political considerations. With significant but limited donor funds available to it, the Tanzanian Government has had to frequently prioritise its applications for assistance in development projects. The Japanese government were therefore requested to provide assistance in the improvement and maintenance of the Dar es Salaam roads instead of the rehabilitation of the water supply. A result of other donors reluctance to use other agencies' feasibility studies as a basis for funding has meant that the rehabilitation of the water supply has been largely neglected by alternative donors for the last five years.

This has meant that many people in the Dar es Salaam municipality have had to continued suffering from a deteriorating water supply and the attendant economic and health problems that come with poor water supply. The improvement of arterial roads has affected a different socio-economic group of Dar es Salaam residents and, although it has had a very real benefit on the economic and general well-being of the region, it is unlikely to have had as great an impact (standard of living/per capita/unit donor funding) as an improved water supply for the residents of the high-density and low-cost residential areas of the city. A second problem associated with the poor planning and politicisation of these two issues is that any major work on the water supply (or in fact any of the services) will now require large sections of the improved roads to be excavated (ie: larger water mains generally run down the centre of the road). This will mean that a significant amount of the benefits gained from the road improvements will quickly be lost. Improved planning and policy coordination at a high level for the operational activities between the various agencies (eg: Dar es Salaam City Council,

NUWA, Planning Commission, and JICA) would not have allowed this situation.

Specific comments on JICA's role

JICA supported the feasibility studies of both the rehabilitation of the water supply and the road improvement and maintenance programme. The survey study teams overlapped and must have been aware of the potential conflict.

While donors may not affect recipient governments' development planning policies or implementation strategies, the lack of stated co-ordination in the separate feasibility studies is noted.

Where a significant planning conflict may occur, and significant sums of donor funding are involved, a responsible third party opinion may have assisted in the decision-making process.

Specific recommendations for project

JICA should continue to examine ways it can assist NUWA to rehabilitate the Dar es Salaam water supply. In the past where the Government of Japan could not bear the full cost, it has encouraged prioritisation onto NUWA. Although NUWA has been able to respond to this, it is no longer a satisfactory solution. The state of the water supply now demands that a complete rehabilitation from treatment through to transmission, conveyance, and distribution is the only viable strategy open to NUWA. If this is too expensive for one agency to support, then NUWA should be encouraged and supported in its efforts to convene a donor conference. It is also essential that the rehabilitation of the water supply is not treated in isolation to the water resource development problem. Action must be taken to resolve this issue at the earliest possible opportunity.

Requests for further surveys

NUWA is presently awaiting a response from the ADB on the water supply rehabilitation programme, the possible convening of a donor conference, and a decision by the cabinet on water resource development before making any further requests for additional surveys or studies.

Annex A: Interview

Interviewees

Mr Hashil, Director of Projects and Implementation, NUWA
Mr Giday G Bhuko, Economist, NUWA
Mr Ebahart D Nyange, Plant Manager (Lower Ruvu), NUWA
Mr Godfrey M Tille, Plant Operations Supervisor (Upper Ruvu),
NUWA
Mr M. Mulagwanda, Senior Executive Engineer, NUWA

Interview notes from Mr Hashil of NUWA.

(Note: Questions given in Italics)

What is the current status of the study?

The study was completed in 1991. There has been no funding yet for implementation of any of the proposals.

The proposals and recommendations were good, we now urgently need increased supply, increased pressure and reduced leakages. The first proposal made to the Government of Japan was not funded because the amount required was too big for a single donor to provide.

The second proposal cut down the scope of work, but again, same answer.

A third proposal was made. A recent mission from JICA looked at the plan and said that the request for implementation was premature. We do not yet have adequate water supply to justify large-scale development of the conveyance system within Dar es Salaam.

In terms of reducing the conveyance losses we have to reduce leakages and illegal offtake.

In town we can install meters and pressure reduction valves and look at the billing procedures for domestic users. The biggest water treatment plant in Lower Ruvu supplies 14 m³/g/d (million gallons per day) and the main from that plant has lots of leakages.

We are now looking closely at supply.

How long does it take between presenting a proposal and getting a reply from Government?

A year or more.

So you now have four proposals in four years, with little time to update and re-formulate the proposal each time?

Yes.

Four years on, how relevant is the original JICA report?

Very relevant, it provides the structure for following reports. The recent ADB report included a review of the original JICA study along with all other previous studies.

The ADB were considering funding the implementation, but recently they've been very quiet. If we can get a donors conference on this issue, we may collectively get the funding. This new study by ADB fills some gaps: Dar es Salaam has grown, and demand increased. The new study includes new storage tanks, the expansion of a water treatment plant, and a new main from the treatment plant to the city storage tanks.

Is there a link with Ruvu River Basin Study?

The study on the Ruvu River basin was requested by us, and went through our parent Ministry (Ministry of Water). It is our hope that now the roads are nearly complete, the main thrust of Japanese aid in Dar es Salaam can go into the water sector.

What % of funding for project implementation comes from the Government of Tanzania?

Very small. We hardly have enough transport to tackle problems such as illegal connections, leakages or non-payment of bills. We can deal with leakages above ground, but underground leaks are harder to locate and repair.

Domestic billing is very difficult. We can present a bill perhaps every five months. Large consumers make individual payments which we bill them for by hand. A few domestic users make payments.

Meanwhile our major costs include electricity for pumping (we are a major consumer of electricity) and water treatment chemicals which have to be paid for in hard currency.

To justify the introduction of water meters, the ADB study says the willingness to pay is there. But we wonder when the resource is there, if the same willingness would exist.

To what extent do your staff work with the survey teams?

There is no formal training, but full cooperation with counterparts for each survey member. Two people were sent to Japan for a short period. Our staff learn the techniques that are employed in the survey. The domestic study of 1994 carried out by JICA trained staff looked mainly at domestic conveyance. However, the emphasis is on supply now. The existing supply network was installed in 1940's and 1950's, and we need to replace pipes.

What is the situation with water-use monitoring?

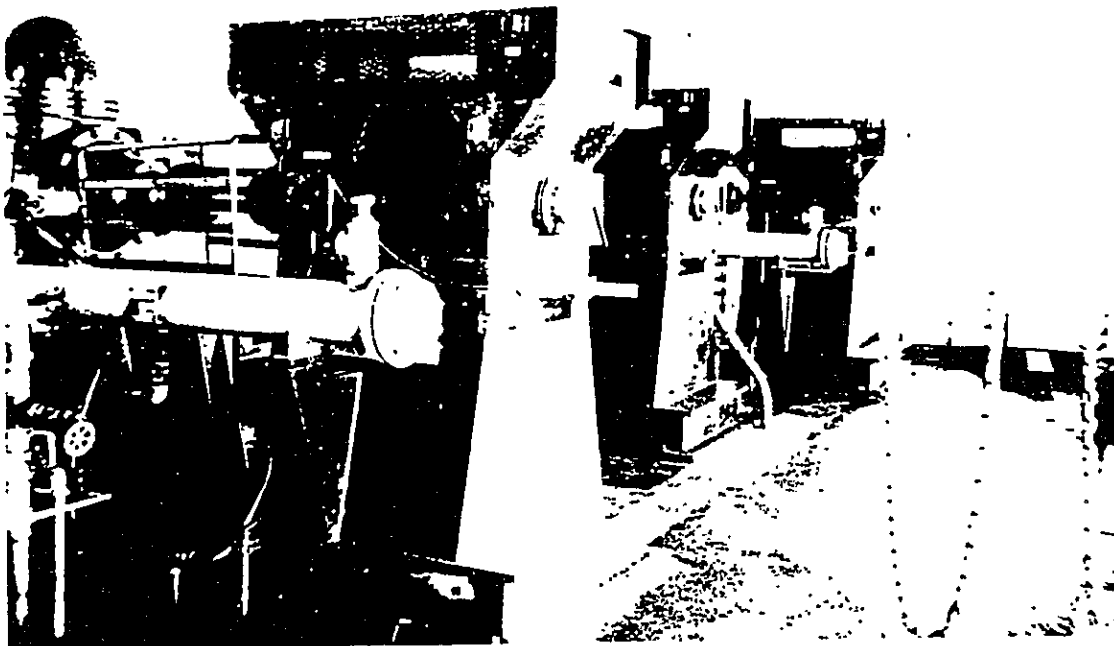
At the time of the JICA survey in 1990, meters were installed on around 1% of registered consumers (45 - 50,000). Now we have around 70,000 consumers, so it may be less.

In the meantime we work in teams on monitoring small areas, but we can only tackle small areas.

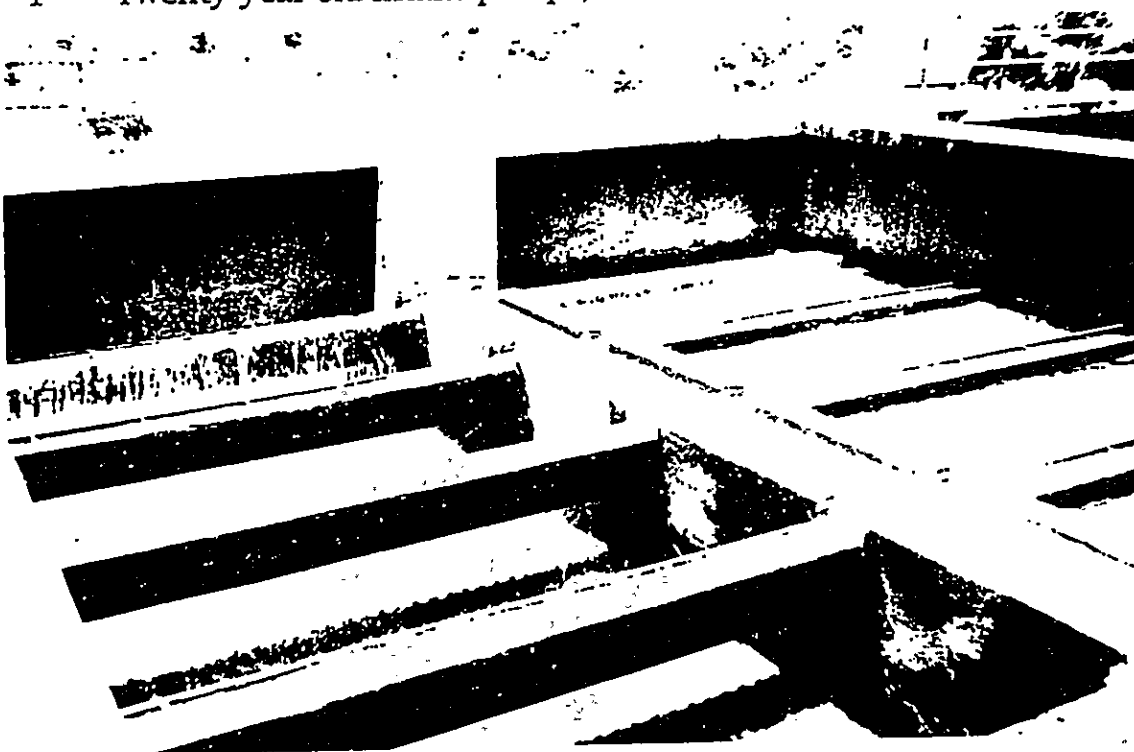
To cut down the original plan to a smaller one required prioritisation of the works, how did you do that?

The prioritisation process was simple, we have to concentrate on conveyance and reducing losses in the system.

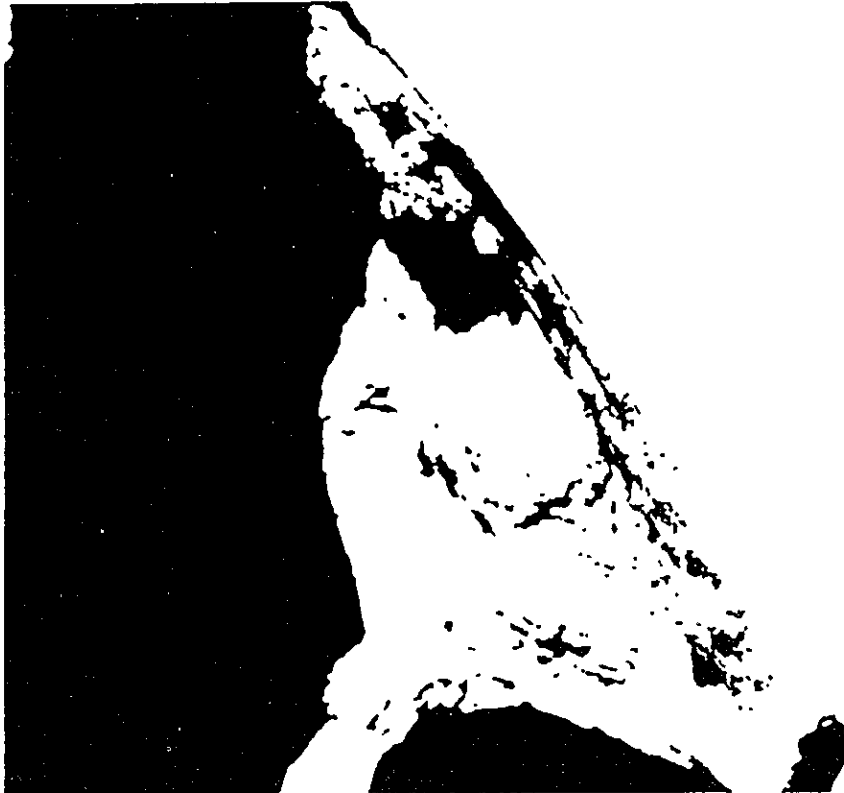
Annex B: Photographs of project



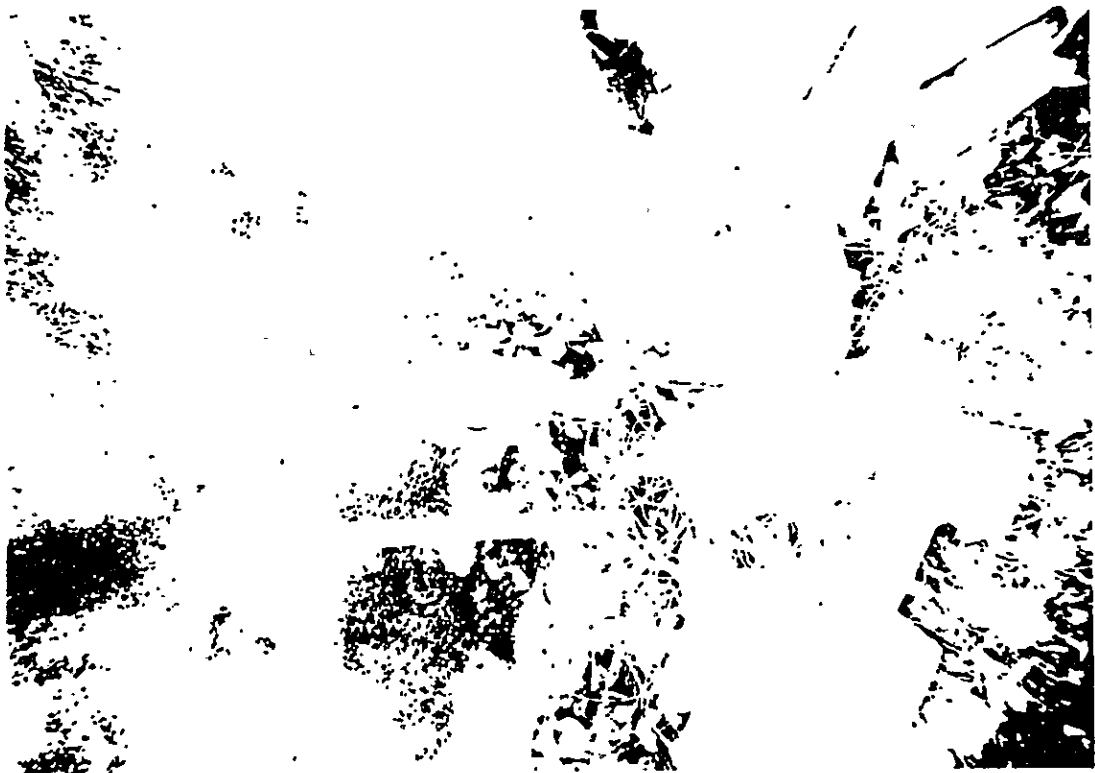
1 Twenty year old intake pumps, Lower Ruvu treatment plant



2 Inoperative sand filtration system, Lower Ruvu treatment plant



3 Encrusted iron water mains pipe, Dar es Salaam



4 Damaged domestic water meter, Dar es Salaam

Annex C: Terms of reference and purpose of survey

Terms of Reference

- The JICA UK Office has requested the consultants to prepare of an independent follow-up survey in Tanzania.
- It is proposed that the work be carried out between Thursday 9th November and Friday 22nd December, 1995.
- The survey will comprise a broad evaluation and current appraisal of thirteen (13) Master Plans, Feasibility Studies, and Basic Studies in comparison to the present and future status of the individual projects or studies.
- The scope of work will cover:
 - a) Study on Water Resources Development in the Ruvu River Basin
 - b) Study on Dar es Salaam Road Development Plan
 - c) Natural Soda Development in Lake Natron and Related Transportation Facilities
 - d) Kilimanjaro Region Integrated Development Plan
 - e) Southern Coast Link Road Project
 - f) Proposed Mahale Mountains National Park
 - g) Lower Moshi Agricultural Development Project
 - h) Mkomazi Valley Area Irrigation Development Project
 - i) Expanded Afforestation Work in the Same District of Kilimanjaro Region
 - j) Road Improvement and Maintenance in Dar es Salaam
 - k) Lower Hai and Lower Rombo Agricultural Development Project
 - l) Rehabilitation of Dar es Salaam Water Supply
 - m) Topographic Mapping of Mwanza-Geita Block in the United Republic of Tanzania
- If possible, the survey will cover recent and relevant developments in the context of each project or study.
- Where appropriate, the reports will comprise questionnaires, interviews and highlight following actions for JICA and/or the Government of Tanzania.
- The reports will contain a detailed itinerary, records of interviews made and sources of information.

- The quantity and quality of information contained in the reports will reflect the availability and accessibility of information in Tanzania.
- The reports will be prepared in draft form and presented to the relevant implementing Ministries for comments before leaving Tanzania.
- Final report texts and layouts will be completed by Friday 22nd December, 1995.

Purpose of survey

This report comprises a descriptive assessment of the progress of the project against the objectives of the project as described in the original study. The purpose of the survey is to:

1. Describe project achievements to date by their:
 - A. Impacts
 - B. Effectiveness
 - C. Relevance
 - D. Efficiency
 - E. Sustainability
2. If required, produce specific and general recommendations to improve the performance of this and other similar projects
3. Further communication between funding agencies, design consultancies, implementing agencies and project beneficiaries

Annex D: Methodology and chronological itinerary

Methodology

As far as possible, the survey was performed by a structured process:

- identify the authorities involved;
- identify and locate key informants within the authorities;
- locate adequate documentation and reportage;
- define aims of project;
- conduct interviews on specific and general issues;
- define indicators of achievement and/or progress;
- visit the site;
- analyse the collected data;
- prepare draft report;
- discuss the draft report with key informants;
- edit and prepare final report text.

Chronological Itinerary

Tuesday, November 14th

Meeting with National Urban Water Authority:
Meeting with NUWA officials

Friday, November 17th

Field survey of Ruvu River water supply and treatment with
NUWA officials
Field survey Dar es Sallam water supply with NUWA officials

Annex E: References & Reports used in survey

JICA, Tokyo Engineering Consultants Ltd (1991) The Study on Rehabilitation of Dar es Salaam Water Supply in The Republic of Tanzania. Final Report, Vol 1. Summary, July 1991

JICA, Tokyo Engineering Consultants Ltd (1991) The Study on Rehabilitation of Dar es Salaam Water Supply in The Republic of Tanzania. Final Report, Vol 2. Main Report, July 1991

JICA, Tokyo Engineering Consultants Ltd (1991) The Study on Rehabilitation of Dar es Salaam Water Supply in The Republic of Tanzania. Final Report, Vol 3. Supporting Report, July 1991

JICA, Tokyo Engineering Consultants Ltd (1991) The Study on Rehabilitation of Dar es Salaam Water Supply in The Republic of Tanzania. Final Report, Vol 4. Data I, July 1991

JICA, Tokyo Engineering Consultants Ltd (1991) The Study on Rehabilitation of Dar es Salaam Water Supply in The Republic of Tanzania. Final Report, Vol 4. Data II, July 1991

Howard Humphreys, NUWA (1995) Rehabilitation of Dar es Salaam Water Supply System. Feasibility Report: Executive Summary, January 1995

Howard Humphreys, NUWA (1995) Rehabilitation of Dar es Salaam Water Supply System. Feasibility Report: Main Report, January 1995

Howard Humphreys, NUWA (1995) Rehabilitation of Dar es Salaam Water Supply System. Feasibility Report. Environmental Impact Assessment Report, January 1995

Howard Humphreys, NUWA (1995) Rehabilitation of Dar es Salaam Water Supply System. Feasibility Report: Appendix, January 1995

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