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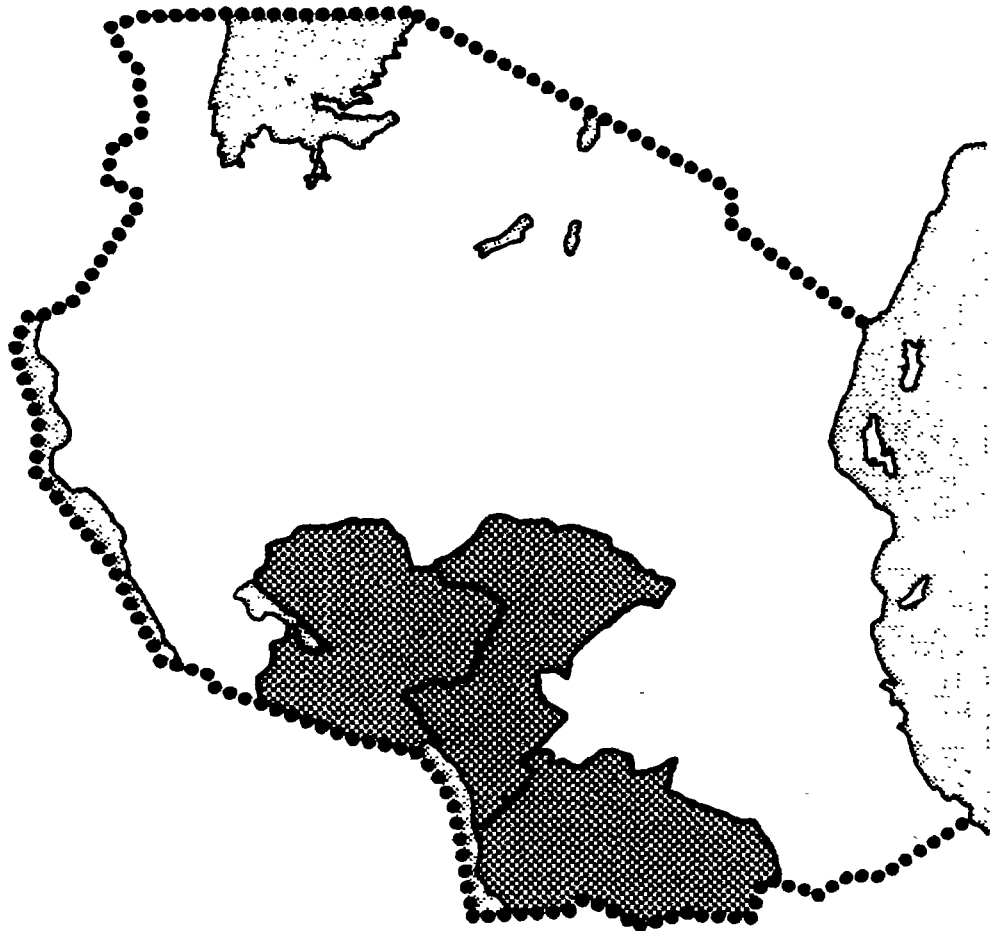
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IMPLEMENTATION OF WATER MASTER PLANS FOR IRINGA, RUVUMA AND MBEYA REGIONS

STUDY OF TRAINING NEEDS , 1986



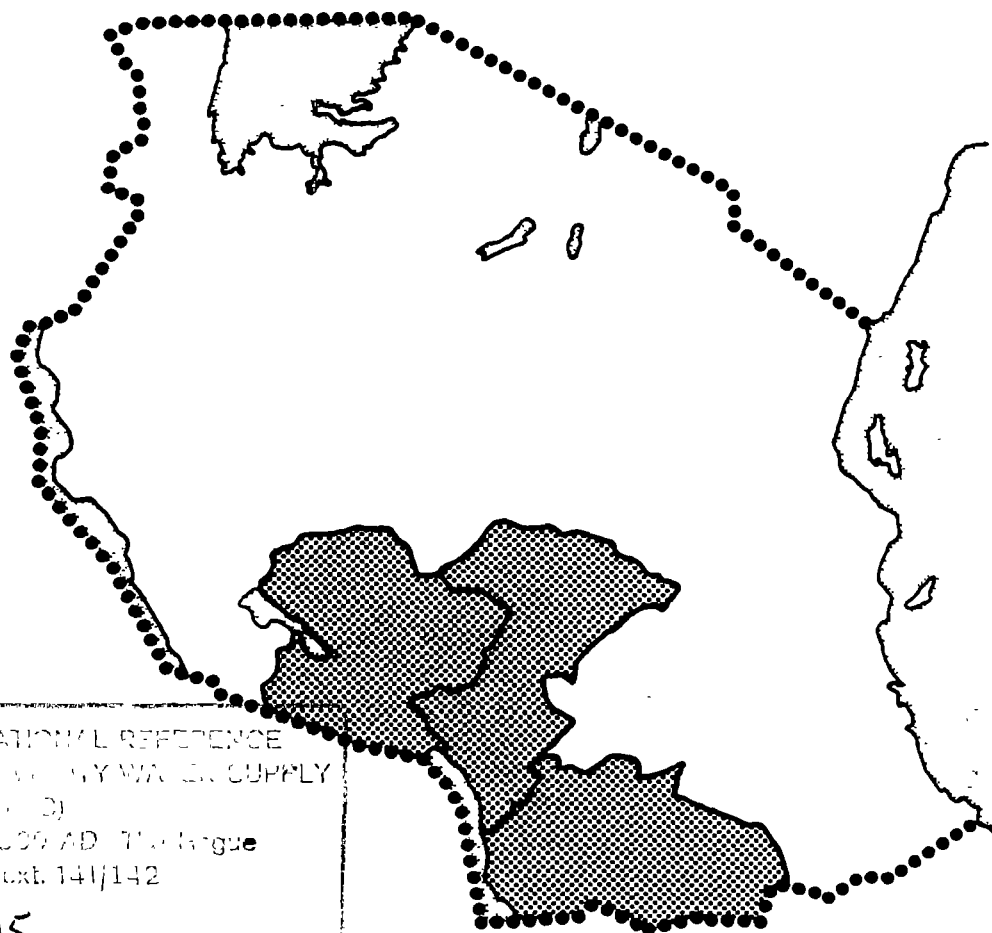


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IMPLEMENTATION OF WATER MASTER PLANS FOR IRINGA, RUVUMA AND MBEYA
REGIONS. STUDY OF TRAINING NEEDS, 1986.

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1. INTRODUCTION

The Tanzanian agency responsible for water supply development, MAJI (at that time: Ministry of Water, Energy & Minerals), in 1983 entered into an agreement with DANIDA with the aim of providing technical and financial assistance to supply approximately 600 villages with safe water in the three southern regions, Iringa, Mbeya and Ruvuma in compliance with the three Water Master Plans prepared by the Danish consultants, CCKK (a joint venture of Carl Bro International A/S - COWIconsult AS - Kampsax - Kryger) assisted by counterpart engineers from MAJI.

At present more than 100 villages have been supplied with water (March 1986). The responsibility for operating and maintaining the completed systems lies with the project group until arrangements have been made for handing over the schemes to the villages.

The project management team has realized that there is an imperative need to provide a steady supply of skilled manpower, particularly at the technician/craftsman level to ensure high productivity and quality during construction and for the continuous functions during operation and maintenance.

This immediately raises the question of an appropriate training input. So far the project has relied on incidentally available manpower and has provided no systematic training input. This is untenable in a project the size and complexity of the Water Master Plan.

Mid-1985 it was therefore agreed to employ a short-term specialist to undertake a training study. The aim of the study was to assess training needs for construction and maintenance work and to outline training programmes with consideration to utilize existing training facilities in Tanzania. (See Terms of Reference, Appendix 1.)



2. SUMMARY

The Water Master Plan Programme has proceeded reasonably undisturbed despite inconveniences caused by staff turn over, recurrent replacement of staff and insufficiently qualified labour.

However, in order to keep up and improve the standard of work performed during the implementation of the programme, the need for manpower training becomes increasingly urgent. In addition, preparation of operations and maintenance staff becomes more critical as implementation of the programme proceeds.

While recurrent replacement of staff increases staff training needs, the need for training and retraining is in addition caused by a generally insufficient training background of the majority of craftsmen and technicians. Systematic training is thus becoming imperative.

Considering that the Water Master Plan is an extensive and complex project, employing approximately 500 people in the Regional Water Engineer's Office and the Implementation Offices in Iringa, Ruvuma and Mbeya and engages a large number of semi-skilled daily paid labourers in the villages, it is strongly recommended that the project be supported by a full time training advisor.

There is ample scope for a training advisor's input into planning, coordinating and assistance in implementation of the training activities that are identified in this study. These include initial training, retraining, institutional training and on-site training.

The study has identified existing training facilities in Tanzania which are suitable for assisting in training programmes. However, few colleges and training centres offer directly applicable courses. Adjustments of courses and curricula currently offered are necessary in accordance with specific needs of the staff in question.



The study concludes that existing training facilities would meet the demand for craftsman training in particular. The training institutions have expressed an interest in cooperation with the project. Spare capacity can be utilized, when the necessary coordination with the training institutions' normal programmes is ensured. This will become a task for the training advisor.

The study recommends on-the-job training for several staff categories. the idea is to involve the project's engineers and technicians as much as possible. This requires extensive cooperation between the proposed training advisor and the supervisory staff to make their participation appropriate.

An increasingly important dimension of training is to enhance the motivation of all staff categories. Village Participation Coordinators (VPCs) should be involved in the organization of training and instructions, in particular those carried out on-site, to help secure the coverage of this aspect.

In order to secure a better recruitment basis for staff with basic skills it is recommended that the Water Project will provide practical training opportunities for trainees at the Vocational Training Centres. This will assist in finding scarce relevant on-the-job training places while helping the Water Project to identify prospective employees.

The study has concentrated on the training needs in the period 1986-88, in order to put forward more specific plans and implicit costs for the immediate needs. It shall be stressed, however, that the Water Master Plan will continuously require staff training far beyond 1988. The ultimate aim of the training activities is to facilitate the take over of the entire responsibilities of the project by Tanzanian staff. It will be a major task of the proposed training advisor to help plan and implement long-term training programmes.



The annual costs involved in the proposed training programmes are estimated at Shs. 1.5 million.

It is believed, that only by systematic training efforts the Water Master Plan will have a fair chance of being sustained.



3. PROJECT ORGANIZATION AND MANPOWER

3.1 Water Master Plan in Respect of Training

The Water Master Plan does not recommend any specific methods for training of manpower.

On training and education the Plan has the following to say (Ref. Chapter 3.7): An important aspect of the Water Master Plan study is the education and training of local staff, including village operators. Three main categories of training programmes are envisaged:

- (a) Field Data collection personnel.
- (b) Water resources study and planning personnel.
- (c) Operation and maintenance personnel.

An important prerequisite for the successful operation and maintenance of water supply systems is the training of local staff for this purpose. Required training and education shall be recommended for village operators as well as for regional water administration staff. Coordination with similar efforts in neighbouring regions shall be undertaken.

The need and possibilities for graduate level education of local staff under scholarships in Denmark or other countries shall be investigated.

In Chapter 11.8 of the Water Master Plan the Water Resources Institute, DSM is mentioned, as a relevant training institution for the Project.

The present study identifies training needs of particular staff categories with the purpose of strengthening the organization and its ability to construct, operate and maintain facilities. Successful implementation is of course conditioned on sufficient allocation of resources.

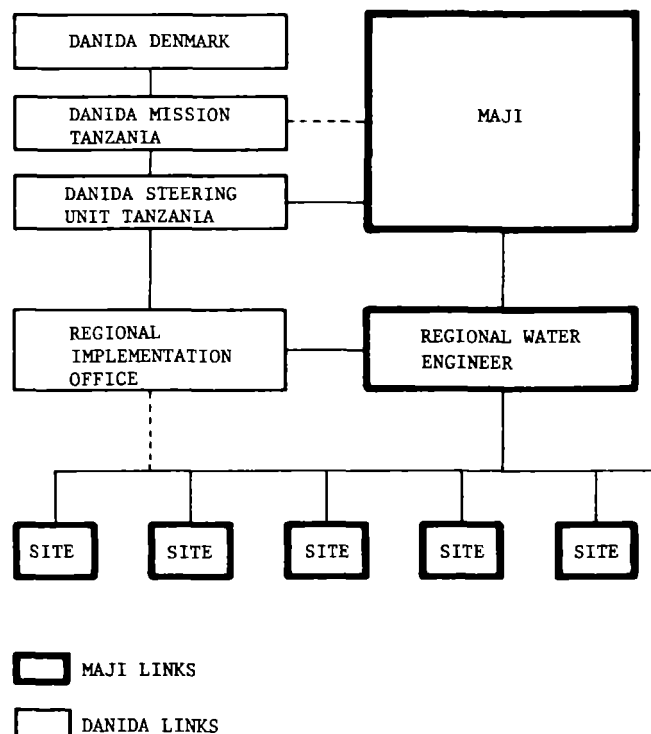
3.2 The Establishment

The Implementation Offices in the regions have been set up under the respective Regional Water Engineers.



The Implementation Offices are staffed with CCKK engineers and locally employed MAJI counterpart engineers, technicians and skilled and unskilled workers. The Village Participation Coordinator (DANIDA employed) and the socio-economic assistants also work within the framework of the Regional Implementation Office.

Organization Plan:



This overall structure is similar in all three regions. Each regional centre comprise workshops and stores, while temporary camps are established at sites as construction proceeds. Each region is also provided with local stores.

3.3 Staffing

The Regional Water Engineer's Office and the Implementation Offices in the three Regions employ the project's technicians, construction workers and other staff, which are listed below. In addition to these, the project employs daily workers and scheme attendants during construction.



Labourers are hired as the construction work proceeds and their number varies accordingly. Scheme attendants and tap attendants are appointed by the villagers - in principle there is one tap attendant per domestic water point and two scheme attendants per village.

IRINGA: Position	RWE	Implementation office	
	Permanent	Expatriate	Tanzanian
Implementation Engineer	-	1	-
Mechanical Engineer	-	1	-
Village Participation Coordinator	-	1	-
Executive Engineer	1	-	-
Asst. Executive Engineer	3	-	-
Mechanical Inspector	-	-	1
Transport Officer	-	-	1
Accountant	-	-	1
Accountants Clerk	-	-	1
Typist	-	-	1
Draughtsmen (part-time)	5	-	-
Mechanics	-	-	-
Site Foremen (technicians)	9	-	1
Plumbers	7	-	-
Carpenters	-	-	-
Masons	4	-	-
Store Keepers	-	-	2
Drivers	3	-	-
Hydrogeologist	1	-	-
Shallow Well Technicians	8	-	-
Hydrologist (part-time)	2	-	-
Hydrology Technicians (part-time)	8	-	-
Surveyors	3	-	-
SEC Assistants	-	-	5
Office Attendant	-	-	-
Turnboys	-	-	-
TOTAL:	54	3	13

Table 3.1: Regional Water Engineer's Staff Attached to DANIDA Sponsored Projects and Implementation Office Staff, Iringa Region, January 1986.



MBEYA Position	RWE	Implementation office	
	Permanent	Expatriate	Tanzanian
Implementation Engineer	-	1	-
Mechanical Engineer	-	1	-
Village Participation Coordinator	-	1	-
Executive Engineer	4	-	-
Mechanical Inspector	1	1	-
Transport Officer	1	-	-
Accountant	-	-	1
Typist	2	-	1
Draughtsmen (part time)	22	-	-
Mechanics (part time)	15	-	-
Site Foremen (technicians)	12	-	-
Plumbers	12	-	-
Carpenters	7	-	-
Masons	7	-	-
Store Keepers	7	-	1
Drivers	12	-	8
Drilling Supervisor	-	1	-
Drilling Technicians	4	-	1
Hydrogeologist	1	-	-
Hydrologist (part-time)	2	-	-
Hydrology Technicians (part-time)	8	-	-
Surveyors (part-time)	15	-	-
SEC Assistants	-	-	13
Office Attendant	-	-	1
Guest House Attendant	-	-	1
TOTAL:	132	5	27

Table 3.2: Regional Water Engineer's Staff Attached to DANIDA Sponsored Projects and Implementation Office Staff, Mbeya Region, January 1986.



RUVUMA Position	RWE	Implementation office	
	Permanent	Expatriate	Tanzanian
Implementation Engineer	-	1	-
Mechanical Engineer	-	1	-
Village Participation Coordinator	-	-	1
Executive Engineer	1	-	-
Ass. Executive Water Engineer	5	-	-
Hydrogeologist	1	-	-
Hydrologist (part-time)	1	-	-
Accountant	-	-	1
Typist	1	-	1
Draughtsmen (part-time)	9	-	-
Store Keepers	3	-	3
Constr. Technicians	11	-	-
Hydrogeology Technicians	11	-	-
Hydrology Technicians (part-time)	10	-	-
Surveyors	6	-	-
Plumbers	14	-	-
Carpenters	5	-	1
Masons	8	-	1
SEC Assistants	-	-	5
Office Attendant	-	-	1
Mechanics	11	-	1
Drivers	8	-	-
Turnboys	2	-	-
Labourers	-	-	9
TOTAL:	107	2	24

Table 3.3: Regional Water Engineer's Staff Attached to DANIDA Sponsored Projects and Implementation Office Staff, Ruvuma Region, January 1986.

With regard to composition of staff at the regional offices no major changes are foreseen. There are shortages of craftsmen in particular, but there seems to be no general shortage of manpower. However, very few of the craftsmen available have sufficient skills. In a later section the need for skill-upgrading and training of particular craft groups are described. Scheme and tap attendants, who are not included in the above tables since they are provided by the villages, will become a more critical group as regards training when maintenance work increases.



Tanzanization of the posts that are now filled by expatriate staff will in the later phase of the project increase the demand for locally available engineers and supervisors.

At present, the annual turnover of staff varies between 10 and 20%, and insufficient staff qualifications are a problem. The training background of the present staff varies from full-scale technical training to on-the-job training only. In all 3 regions there is a need for better provision of workers with basic skills and for skill upgrading.

For the time being the most critical manpower requirements and training needs are in the skilled craftsman categories. The following section elaborates on specific manpower requirements for construction and maintenance work over the next three years.

3.4 Manpower and Training Needs

The immediate manpower and training needs in the Water Master Plan implementation programme focus on the ongoing construction work, but preparation of manpower for operation and maintenance should take place simultaneously.

The following estimates of training needs for 1986-88 are based on the assumption that construction work will proceed as outlined in Table 3.4, requiring a total number of construction teams of approximately 20 in the three regions over the next three years. Manpower forecasts are based on the composition of a typical construction team and on calculations of the necessary number of auxiliary staff, e.g. store keepers, drivers, auto mechanics and scheme attendants.

More detailed recommendations for training programmes are set out in section 5, where training costs are also calculated based on information from existing training institutions of relevance to the programme.



It is strongly emphasized, that the demand for training will not be limited to the years 1986-88, the period for which we have put forward more specific recommendations. There is an increasing training need in the construction phase, and it will continue - although differently weighted - during operation and maintenance.

According to Regional Implementation Plans for 1986-88 the following number of construction teams are required:

Region	1986	1987	1988
Iringa	6	7	7
Ruvuma	6	7-8	8-9
Mbeya	6	6	7
Total No. of teams	18	20	22

Table 3.4: Minimum Number of Construction Teams Required in Iringa, Ruvuma and Mbeya, 1986-1988.

The composition and size of the construction teams vary, depending i.a. on the availability of local craftsmen. It is the skilled craftsmen and technicians on the construction teams who are in urgent need of training. The majority of construction workers are unskilled, voluntary labourers, who are engaged locally. No training programmes are envisaged for this category of construction workers in this report, but improved instruction on-the-job is recommended for all construction workers.

The composition of a typical construction team with regard to skilled personnel looks as follows:



Category	Nos.
Foreman	1
Technicians	2
Plumbers	1-2
Masons	1-2
Carpenters	1

Table 3.5: Typical Composition of a Construction Team, Skilled Personnel.

Estimates of the total number of skilled staff required for construction work in the three regions thus amounts to:

Category	1986	1987	1988
Foremen	18	20	22
Technicians	36	40	44
Plumbers	27	30	33
Masons	27	30	33
Carpenters	18	20	22

Table 3.6: Total Number of Skilled Staff Required for Construction Work, 1986-88.

Based on the following assumptions,

- (a) The annual replacement (turn-over) varies between 10 and 20 per cent (20 per cent has been used)
- (b) 1/3 of the existing staff needs basic training
- (c) Retraining will be needed every 2nd year,

Training and retraining demands for the skilled personnel categories are shown in Table 3.7 and 3.8 below:



Category	1986	1987	1988
Technicians	12	8	9
Plumbers	9	6	7
Masons	9	6	7
Carpenters	6	4	5

Table 3.7: Number of Technicians and Craftsmen Demanding Basic Training, 1986-88

Category	1986	1987	1988
Technicians	12	20	22
Plumbers	9	15	16
Masons	9	15	16
Carpenters	6	10	11

Table 3.8: Number of Technicians and Craftsmen Demanding Re-training, 1986-88

In addition, it is anticipated that all foremen - i.e. approximately 20 - will need a one-week course annually.

Likewise, auxiliary staff categories shall be considered for training. These are:

Storekeepers:	2 at regional stores, 1 per construction team - total number in all three regions:	24-28
Drivers:	Approximate total number in all three regions:	60
Auto-mechanics:	Approximate total no. in all three regions: and at the Steering Unit, Dar es Salaam:	40 8
Surveyors:		20
Accountants (incl. at DSU)		5

The above number of employees are not foreseen to change significantly.



While the immediate training needs are concentrated in the craftsmen categories, which are very critical in the construction phase of the programme, the demand for qualified staff for operation and maintenance is already increasing. In addition to technicians, plumbers, masons and carpenters, for whom there will be a continuous demand scheme attendants are becoming an increasingly important staff category in maintenance work. At present there should be approximately 200 scheme attendants on completed or nearly completed schemes, and their number is expected to grown with about 60 every year.

Section 5 of this report outlines the more specific training programmes recommended for each staff category in light of the possible utilization of existing training facilities in Tanzania. these facilities are described in the following section.



4. PERSPECTIVE OF UTILIZING EXISTING TRAINING FACILITIES

4.1 Introduction

So far no systematic teaching or training takes place within the programme. Training activities are incidental, like in Mbeya where a Danish volunteer, Mr. Ph. Schmidt has given individual lessons when needs have been identified and time has allowed. It is the impression that the benefit of these lessons has been great and it is strongly recommended that similar activities are included in the other regions. Facilities exist in all three regions to implement such courses. However, the programme should be strengthened on the instructor side, since all staff is fully utilized and can be released only to a limited extent for training.

Relevant training facilities are available in Tanzania for a number of the training needs that can be identified in the programme. Courses are in a few cases readily available but will need adjustment to the specific needs of the programme staff.

Below, the relevant existing training facilities are described. A general description of technical education in Tanzania follows.

4.2 Technical Education in Tanzania

4.2.1 Vocational training

The official vocational education in Tanzania is given at 5 different Vocational Training Centres around the country (see below). The minimum entrance qualifications are completion of primary school, but many applicants have completed secondary school to form 4 level.

As there are places for 25% of the applicants only who pass the entrance exam, there is ample room to select the applicants with the best basic qualifications.



Normally the training takes 4 years, namely 1 year at a Vocational Training Centre followed by 3 years practical work in a workshop or a factory. A test is given after each year of practical work, and there is a final exam on completion of the course.

During the first year (the basic year) the students are introduced to the use of materials and practical skills in workshops. Besides, they are taught traditional subjects like arithmetic and languages, in addition to which they are obliged to undergo political education.

In addition to Vocational Training Centres there are various mission-centres around the country where craftsmen are trained, e.g. Peramiho near Songea. Training at these places takes 3 years and it is the impression that the craftsmen produced from these centres are of high quality.

In reality though, many who call themselves craftsmen are in fact self-taught, without any formal training.

4.2.2 Training of Technicians

There are various methods of training higher technical grades in Tanzania. The direct route to a B.Sc. in engineering involves:

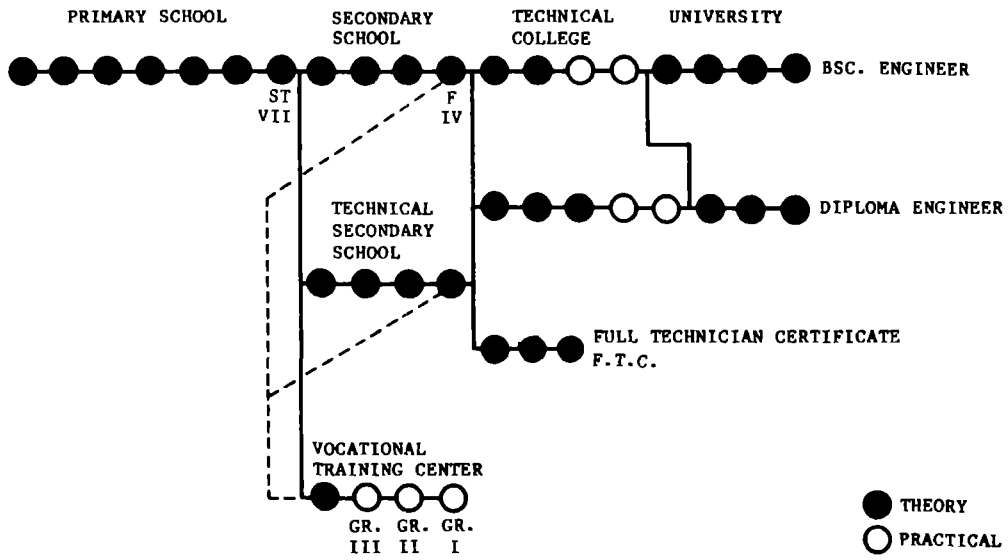
Primary school (7 years), secondary school (4 years), technical college (2 years) + 2 years practical work followed by 4 years at university.

Another possibility is to go to a technical secondary school for 4 years after primary school, and thereafter to a technical college for a further 3 years. This course leads to a "Full Technician Certificate" (FTC).

Otherwise students can continue for 3 years and become Diploma Engineer.



Diagram: Technical Education System



4.3 Training Facilities

It is the impression that some facilities are not used to their full capacity and could provide opportunities for undertaking additional courses. However, the courses suggested for the Water Master Plan Project should preferably be undertaken at term breaks, in order not to intervene with the institutions' ordinary programmes.

Training activities should be outlined, planned and budgeted in conjunction with the development of regional implementation plans and approved organizational proposals.



Present educational institutions such as the Water Resources Institute, University of Dar Es Salaam, and technical colleges should be drawn upon in planning and executing specific training programmes, not only to utilize the resources and experience they represent, but also to strengthen the basis for continuous adjustment of their curricula, funds allocated etc.

Among the existing training facilities the Water Resources Institute, Ubungo, is most relevant for training of technicians, while Dodoma VTC and Saruji Training Institute, Waso Hill are considered more appropriate for craft-training.

4.3.1 Engineering and Technician Training Institutions

Water Resources Institute

The Water Resources Institute, which is situated at Ubungo outside Dar Es Salaam, was established in 1974 and is under the authority of the MAJI.

The Institute is a boarding school and offers two types of courses:

- Full technician certificate courses for three years. These courses are at the senior secondary level. Admittance requirement is Form 4. Students graduated from the institute with a full technician certificate (FTC) are recognized for admission to the University's faculty of engineering. The total number of students graduating annually with a FTC is approximately 130 with the following distribution: 15 specializing in water quality, 90 specializing in works, 15 in hydrogeology and 15 in hydrology.
- The Institute also offers in-service and upgrading courses of various length ranging from one to twelve months.

Present facilities are insufficient and the training is suffering from lack of laboratories and workshops.



The Institute is very interested in cooperating with the project in devising short courses especially designed for technicians. The training should in principle be free as the Water Project and the W.R.I. come under the same ministry (MAJI), but as the Institute suffers from lack of finance, DANIDA sponsorship would be essential for the running of these courses.

Saruji Training Institute, Waso Hill - Dar Es Salaam

The DANIDA supported Saruji Training Institute is an educational institution which specializes in the training of craftsmen and technicians employed by the Tanzania Saruji Corporation (the cement works).

In addition it offers a number of short courses to people not employed by the cement works. They specialize in the following courses:

- Heavy Equipment Mechanics
- Light Equipment Mechanics
- Auto Electrical
- Diesel Engine
- Petrol Engine

A shorter course is given in management. The "On the Job Trainer" course is especially aimed at staff management, and is of 4 weeks duration.

The price per student is 800 Shillings per day. This covers tuition fees, board and lodging. The maximum number of students is 15 to 18.

Courses for the Water Project must take place during the first 3 months of the year, i.e. January, February or March.

Ardhi Institute, Dar Es Salaam

The Ardhi Institute which is situated in a suburb of Dar Es Salaam close to the University specializes mainly in building construction.



This field does not coincide with the needs of the water project, but the Institute is interested in cooperating in the running of short courses in the following subjects:

Economics
 Planning and administration
 Staff management

Any possible course arising from this cooperation would be aimed at the project's local engineers employed by MAJI in the 3 regions.

4.3.2 Vocational Training Centres

In the following the 5 Vocational Training Centres in Tanzania are described. Courses which could be of interest for the water project are marked with an x.

VTC Dodoma

This centre, which has received assistance from DANIDA, was opened in October 1983. It is well equipped with tools and machinery. It is provided with good instructors capable of running short courses.

The capacity is approximately 300 students. There are boarding facilities for 36 students.

The following courses are available:

	Blacksmith
x	Carpentry/Joinery
	Civil Draughting
	Electrical Installation
	Fitter Mechanic
x	Masonry/Bricklaying
	Painting
x	Plumbing and Pipe Fitting
x	Welding



The VTC Dodoma being located closer to the project is considered the most relevant for providing training facilities for the Water Project.

VTC Changombe, Dar Es Salaam

This centre, which has been established for a long time, provides the following courses:

- x Auto Electrical
- Blacksmith
- x Carpentry/Joinery
- x Civil Draughting (2 year course)
- Electrical Installation
- Fitter Mechanic (2 year course)
- Fitting and Turning
- x Masonry and Bricklaying
- x Motor Vehicle Mechanics
- Painting
- x Plumbing and Pipe Fitting
- Radio Repair
- Refrigeration/Air Condition
- Road Construction
- Shoe Making
- Tailoring
- Tool and Die Making
- Welding and Fabrication

VTC Moshi

This centre, assisted by SIDA, is very recently opened and is exceptionally well equipped with tools and machinery. There is great capability for running short courses, but the long distance from the 3 southern regions makes the placing of courses here less suitable. Moreover most of the courses available at this centre are concerned primarily with metal work.



The following courses are available:

	Blacksmith	
x	Diesel Engine Mechanics	
	Electronics	2 years
	Foundry	
	Heating and Ventilation	2 years
	Industrial electricity	
	Instrument Mechanics	
	Machine Tool Repair	
	Machinery Fitting	
	Mechanical Draughting	2 years
	Refrigeration/Air Condition	
	Tool and Die making	2 years

VTC Tanga

This centre has been in existence for 10 years and provides the following courses:

	Blacksmith
x	Carpentry/Joinery
	Electrical Installation
	Fitting and Turning
x	Masonry and Bricklaying
X	Motor Vehicle Mechanics
	Painting
x	Plumbing
	Printing and Bookbinding
x	Welding

The long distance from the 3 southern regions makes VTC Tanga less suitable for short courses.

If Tanga VTC, nevertheless, is considered it provides several relevant courses for the water project as indicated.



VTC Mwanza

This centre has been functioning for 8 to 10 years. It is exceptionally well equipped with tools and machinery and is efficiently administered.

The following courses are available:

- Blacksmith
- x Carpentry/Joinery
- Electrical Installation
- Fitting and Turning
- x Masonry and Bricklaying
- x Motor Vehicle Mechanics
- Painting
- x Plumbing and Pipe Fitting
- x Welding and Fabrication

4.3.3 Other VTC Centres

There are some smaller vocational training centres around Tanzania e.g. Songea and Iringa, but unfortunately these are so poorly equipped that it would be impractical to run short courses at their premises without supplying a large amount of technical equipment and qualified instructors.

4.3.4 Other Training Possibilities in TanzaniaMission Centres

Among the mission centres around Tanzania which train craftsmen is Peramiho situated 25 km from Songea.

The following courses are available here:

- Carpentry/Joinery
- Motor Vehicle Mechanics
- Printing
- Blacksmith & Welding
- Fitter Mechanic
- Tailoring



The training takes 3 years with 30 students to each course. It is the impression that the training given here is of very high standard, and the work being done in the carpentry/joinery workshop is amongst the best in Tanzania.

Unfortunately it is not possible to run short courses there. However, it is strongly recommended that carpenters and motor vehicle mechanics from Peramiho are employed on the project in the Songea area, so that others can be exposed to their high standards.

In addition to the above-mentioned training institutions, which could provide opportunities for additional courses for the Water Project, training facilities at the three regional centres should also be utilized. Each centre is provided with physical training facilities, which are not fully utilized due to lack of sufficient instructional capacity. Only in Mbeya the facilities are regularly used by the Danish volunteer.

4.3.5 Conclusion

To sum up: A number of existing training institutions in Tanzania provide courses of relevance to engineers, technicians and craftsmen-training in the Water Project. Training institutions have expressed an interest in cooperating with the project and have the potential to provide the necessary training courses.

Most courses will need some adjustments to meet the needs of the project. This should not cause insurmountable problems if the necessary timing of water-project related courses is coordinated with the institutions' normal training programmes and placed between semesters. Spare capacity in the institutes would allow some intake of external courses, but instructor capacity may have to be strengthened by hiring external instructors for specific courses. Training facilities, teaching aids, etc. may likewise have to be supplemented for the specific courses.

In section 5 the cost of utilizing existing training facilities is estimated, and relevant on-the-job training is outlined.



5. IMPLEMENTATION OF TRAINING PROGRAMMES

5.1 Introduction

In the previous section the existing training facilities of relevance for the Water Project are listed. In this section the training requirements for particular skills are discussed. It outlines relevant training programmes while a detailed description of curricula must await the involvement of training specialists in the various trades.

It should be stressed that while existing training institutions run courses related to the requirements of the project, adjustment of existing training courses will nevertheless be required. An exception may be Saruji and the Water Resources Institute where relevant courses may be selected directly from among the courses already offered.

With regard to on-the-job training courses, to be given within the project itself, it is recommended that this be undertaken by the project engineers and supervisors to the degree possible. However, since staff is already fully utilized for their current jobs, it will be necessary to support their training function. This can be done by leaving the necessary planning to be undertaken by training advisor, who will also assist in implementing instructions where possible.

5.2 Trade Specific Training Recommendations

The training requirements and programmes discussed in the following are concerned with maintenance at village level, construction works and regional workshops.

In all groups marked in Table 5.1 a training need has been identified. The urgency varies between trade groups. A realistic training programme for the whole project must also take into consideration the availability of training facilities.

This section attempts to outline trade specific training programmes.



Table 5.1: Trade Groups Recommended for Training.

Trade	Construction Work	Regional Offices	Maintenance at Village Level
Scheme attendant			x
Tap attendant			x
Mason	x	x	
Carpenter	x	x	
Plumber	x		
Auto Mechanic		x	
Driver	x	x	
Store Keeper	x	x	
Foreman/site engineer	x	x	
Engineer	x	x	
Surveyor	x	x	
Accountant		x	

5.2.1 Scheme Attendants

There will be a need for training scheme attendants for each scheme, and decentralized courses could be run in each village.

Scheme attendants should be trained in the following:

- Replacement of damaged plastic/GS pipes by careful excavation; removal of damaged pipes and replacement with new pipes; backfilling after repairs without using stones and to the correct level.
- Replacement of gaskets in water taps
- Checking and repairing of hand pumps
- Maintenance of air valves
- Clearing of spaces around domestic water points and cattle watering areas to avoid the build-up of pools of water which provide hatching grounds for mosquitoes.
- Maintenance of water intake to the system
- Cleaning of tanks and flushing of pipes.

Figure 5.1: Scheme attendants.



The training should take place in the villages as the scheme attendants might otherwise tend to leave for the city upon finishing their training. It should be considered whether the award of a diploma on successful completion of training would better motivate people. However, there is a danger that feeling better educated they will be inclined to try their luck in the city.

A parallel can be drawn with the MOH/UNICEF programme in which Village Health Workers are trained more or less like scheme attendants. These Village Health Workers receive their formal training outside the villages. The experience is that some leave the villages on completion of their training.

The main priority of the training scheme should, however, be to motivate the scheme attendants and instil in them a sense of responsibility for their schemes.

Training should be organized by the Village Participation Coordinator (VPC) in cooperation with project engineers and technicians. Scheme Attendant training should be on-the-job instructions on the sites combined with a one-day seminar. Seminars can be arranged for groups of 15-20 of the regional centres on an annual basis. The costs will mainly be for allowances and transport.

5.2.2 Tap Attendants

Tap attendants are assigned on a voluntary basis by the villages for each domestic water point. Tap attendants' responsibilities are to ensure cleanliness and proper usage of water taps. As schemes are being completed and more villages provided with domestic water points the need for training of tap attendants will increase. Just as for scheme attendants decentralized, on-the-spot training should be undertaken in the villages, possibly jointly with instruction of scheme attendants.



5.2.3 Masons

Training of masons can take place at the Vocational Training Centre in Dodoma. The course should be no longer than 2 weeks and should run during January/February or September at term breaks. The following subjects are recommended:

- The process of concreting
- Mix proportions
- The binding and placing of reinforcement
- Bricklaying
- Accurate measurement

There should be no more than 15 students on a course. This does not fully satisfy the estimated training need for masons (ref. Section 3) which is for 18, 21 and 23 persons for 1986, 1987 and 1988 respectively.

The price of a course will be 700 Sh. approx. per student per day including board and lodging. Total running costs per course (15 participants):
 $15 \times 14 \times 700 = \underline{147,000 \text{ Shilling.}}$

5.2.4 Carpenters

Training of carpenters/joiners can take place at the Vocational Training Centre in Dodoma. The course should last a maximum of 2-3 weeks.

The courses should run during January/February or September and the following subjects are recommended:

- Material properties (hard wood/soft wood)
- Handling of tools
- Using machinery
- Accurate measurement
- Sawing
- Formwork for concrete
- Planing



A realistic number of participants per course, given the facilities, is 12. This complies well with the estimated need (ref. Section 3), which is 12, 14 and 16 for 1986, 1987 and 1988 respectively for training of carpenters.

The price of the carpentry/joinery course will be 700 Sh. approx. per student per day including board and lodging. Total running costs for a 2 week course for 12 students: $12 \times 14 \times 700 = \underline{118,000 \text{ Shillings}}$.

It should be pointed out that the Regional carpentry workshops are very poorly equipped with tools and machinery. There is one smoothing plane only and one drilling machine at the workshop in Iringa, and one circular saw and one smoothing plane at each of the workshops in Mbeya and Songea. An evaluation should be made of the appropriate provision of tools and machinery at the workshops. Well supplied workshops will both increase productivity and the effect of training.

5.2.5 Plumbers

Training of plumbers can be done partly by on-site-training, and partly by means of a 2 week course at the Vocational Training Centre in Dodoma. Training on-site should preferably be undertaken by the Water Project's engineers and the foremen.

The courses should run during January/February or September not to interfere with the Centre's own courses.

The following subjects are recommended:

- Material properties (steel and PVC pipes)
- Cutting of pipes
- Laying of pipes in trenches and on ground
- Joining of pipes with the use of fittings
- Thread-cutting



A realistic number of participants per course with the present the capacity is 12. This does not satisfy the estimated demand, (ref. Section3), for training of plumbers which is 18, 21, 23 in 1986, 1987 and 1988 respectively.

The price of a 2 week course will be approx. 700 Sh. per student per day including board and lodging. Total running costs per course: $12 \times 12 \times 700 = \underline{101,000 \text{ Shillings}}$.

It might be necessary to run 2 courses per year for plumbers to fulfil the demand, but for the time being only one course is recommended.

5.2.6 Auto Mechanics

It is of vital importance for the success of the Water Project to have a well functioning vehicle pool. Thus, there is a need for training of auto mechanics.

The training can take place in two ways:

- First, there should be a fixed day each month at the various workshops where pressing problems can be attended to. The training should be supervised by the workshop manager. It is strongly recommended that Danida sponsored workshop managers should have teaching experience, e.g. instructors/teachers from auto-mechanical departments of technical colleges.
- Secondly, there should be a 4-week course annually for say one third of the mechanics (i.e. a total of 15-16). This course can be run at the Saruji Training Institute, Waso Hill, Dar Es Salaam, where all the necessary facilities are available. The timing of the course should be during the first 4 months of the year to avoid interference with the Institute's own courses.



The following subjects are recommended:

- Fault-finding
- Electrical system
- Diesel and petrol engines
- Ignition system
- Charging system
- Starter system
- Steering system
- Brake system
- Fuel system
- Cooling system
- Lubrication system

The price of a 4-week course will be approx. 800 Sh. per student per day including board and lodging. Total running costs per course: $28 \times 15 \times 800 = \underline{336,000 \text{ Shillings}}$.

5.2.7 Drivers

A short course should be offered in each of the three regions on a regular basis, emphasizing minor fault-finding and repairs which can be attended to on the spot. The following are examples of recommended subjects to be taught:

- Changing and cleaning of fuel filters
- Changing spark-plugs
- Cleaning airfilters
- Replacing rear, head and interior lights
- Changing wheels
- Checking cooling system
- Checking brake fluid
- Checking the engine oil level

It is also recommended that a check-list is introduced to be completed each time a driver takes a vehicle out of the workshop. The following are examples of what should be included in this list:



- Checking tyre pressure (also the spare wheel)
- Is the jack present?
- Is the electrical system working?
- Is the tool kit complete? etc.

On the spot training of drivers should in addition to the practical instructions aim at increasing their motivation. It is therefore recommended that drivers are called in for a $\frac{1}{2}$ -1-day "seminar" at the regional centre every six months.

Cost for this type of training arrangement will be limited to transport and allowances.

5.2.8 Store Keepers

The Water Project has a central store in each region and a number of local scheme stores.

It is the impression that the positions of store keepers are reasonably staffed in all three regions. The layout and organization of the stores in the 3 regional workshops is improving. However, there is a desire for training in the paper-work related to receiving and distributing stock (a system of control). Such training should take place regularly for people from all regions (approximately 25).

It is recommended that all construction stores are inspected regularly and that the store keepers are trained at RWE yards or at other schemes with experienced store keepers.

Training costs are anticipated to involve transport and allowances only.

5.2.9 Foremen (Site Engineers)

It is strongly recommended that the preparation of a construction manual is given a high priority, so that the training of foremen can be based on a common approach in all three regions.



The actual training in using the manual can be organized by the Regional Implementation Engineers.

A one week annual course is suggested in each of the 3 regions for foremen. Classroom facilities are available at each of the 3 regional centres.

The following subjects are recommended for a start:

- Planning and supervision of work
- Budgeting of resource allocations
- Estimation of materials and time
- Good workmanship
- Quality control

Cost for this type of training arrangement will be limited to transport and allowances.

5.2.10 Engineers

There is a great need for in-service training for engineers.

It is recommended to continue with the weekly meetings between CCKK's engineers and their local counterparts during which identified problems can be discussed.

Furthermore, a 4-week training course should be planned to take place annually.

The following are examples of recommended subjects:

- Budgeting of resources
- Planning and supervision of work
- Staff management
- Control Systems
- Estimation of materials and time



This course can be run at the Water Resources Institute in Dar Es Salaam. There might not be any tuition fees involved as the WRI is part of the same Ministry as MAJI.

In addition to the suggested in-country training of engineers, it is recommended that study tours be arranged to other projects inside Tanzania or in neighbouring countries.

Such arrangements will involve transport, accommodation and allowance costs.

5.2.11 Surveyors

Reference is made to the comprehensive CCKK report of November 1984: "Training of Surveyors in DANIDA Sponsored Implementation Plans".

5.2.12 Accountants

There is no immediate need for training of accountants. If training is found to be necessary in future, contact should be made to The Eastern and Southern African Management Institute, Arusha, where a relevant course is run. The course is entitled Advanced Management Accounting.

Duration of course: 6 weeks

Price: US \$ 3,182 per student.

More detailed information about course contents should be obtained prior to further considerations on participation.

5.3 Estimated Training Costs

The above recommendations for trade specific training and implicit training costs are based on what is supposed to be realistic assessments in terms of training capacity and facilities. They do not in all cases cover the estimated training needs (ref. section 3). In order to cover the entire training needs of the programme, training capacity would have to be extended. For the time being, however, the recommended scope of training activities will provide a very important input to the programme.



The costs involved in the first year will be based on current prices be approximately Shs. 700,000, excluding transport, allowances and what might be necessary for training aids, and excluding the cost for a training advisor.

The first year costs for allowances and transport are for the proposed training activities assessed to be in the magnitude of Shs. 800,000.



6. CONCLUSION AND RECOMMENDATIONS

It has been observed that the Water Master Plan project is negatively affected by high turn-over of many staff categories. Obviously, the programme will be faced with relatively high turn-over rates as long as some staff categories can find more attractive and better paid employment. This applies particularly for the programme's craftsmen and technicians whose terms of employment including wages do not compare favourably with those of the private sector.

It is expected that more systematic training efforts will increase the motivation and efficiency of personnel. It is recommended that MAJI employs more local people on a permanent basis to minimize the turnover of staff. Incentives to be considered would be housing allowance and better payment.

Training programmes for the more important staff categories have been identified in Chapter 5 and training facilities have been recommended accordingly. It has been attempted to estimate costs of the recommended training courses. The total cost of the recommended training has been estimated at some Shs. 1.5 million including allowances and transport cost, but excluding cost of a training advisor, and cost of time spent by personnel already employed on the project. This amount is less than 2% of the annual budget for the whole project.

In order to maximize the benefit of training it is recommended that the carpentry workshops in Iringa, Songea and Mbeya are examined and supplied with the necessary tools and machinery. It is also recommended that the situation of the Iringa vehicle workshops is clarified and decisions made as to whether or not the project shall continue to cooperate with the Wood-Bamboo Department or with Regional Water Engineers.

It has been observed that technical/vocational training centres face difficulties in providing practical training opportunities for their trainees. It is recommended that the Water Project should offer practical training opportunities, since this will also increase the recruitment base for the Water Project of promising craftsmen and technicians.



The important role of local Scheme Attendants should be emphasized. They fulfil probably the most important role in the operation and maintenance of the completed system. Likewise, tap attendants will become an important group as operations and maintenance work increases. We wish to emphasize the importance of creating a change of attitude in the population in order to create better motivation and a feeling of responsibility towards the water system. The Village Participation Coordinator (VPC) should be involved in training activities at village level and also assist in achieving a positive response and attitude in the community. It is recommended that expatriate staff get Swahili training to improve cooperation and smooth running of the project, and better communication with villagers.

To initiate this process of training and motivation it is strongly recommended that the project is strengthened by a training advisor. The training advisor will be responsible for planning and coordinating training programmes in cooperation with the project's engineers and supervisors and with external training institutions. To the degree possible the training advisor will assist in training, while also considering where external training instructors can be applied in the project.



TERMS OF REFERENCE

The Terms of Reference for the Training Study in the three Regions as contained in the letter from the DANIDA Steering Unit of August 30th 1985 outlined the following purposes:

- Evaluate the organizational framework for construction work and formulation of an outline for training programmes, taking into account the possibilities of utilizing existing training facilities in Tanzania;
- Assess training needs for staff at regional vehicle workshops and stores for spare parts, construction materials and equipment;
- Assess training needs for maintenance work at village level and formulation of an outline for training programmes.

In order to fulfil the study objectives the specialist should include but not be limited to undertake the following tasks:

- Review the current construction organization;
- Review the skills composition and educational background of the existing work force;
- Assessment of present constraints in the existing composition and organization of the work force;
- Demand forecasts for the various categories of manpower based on expected construction progress and taking retirement into consideration;
- Evaluation of existing relevant educational facilities quality- and capacity-wise;
- Assessment of training needs to be undertaken within the project organization, i.e. provision of basic skills and skills upgrading;
- Preparation of outlines for training courses commenting on curricula development, equipment, physical facilities and trainers;
- Assessment of training needs for scheme attendants at village level for maintenance and preparation of an outline for training.

The field work in Tanzania was undertaken by Mr. Preben Thomsen Architect m.a.a. from January 24th to March 1st, 1986. (For detailed time-schedule, persons contacted and main discussion points see Appendices 2 and 3.).



TIME SCHEDULE	Date
Arrival Dar Es Salaam	24.01.1986
Dar Es Salaam	25.-26.01.
Meeting with Danida Steering Unit	27.01.
Meeting with Director M.H. Manyanga and Deputy Director A. Athumani, Vocational Training Divisions, DSM	
Meeting with Danida Steering Unit	29.01.
Visit at Danida Mission	
Visit at Saruji Training Institute	30.01.
Visit at Water Resources Institute and Danida Steering Unit	31.01.
Driving Dar Es Salaam - Dodoma	01.02.
Dodoma	Sunday 02.02.
Visit at Vocational Training Centre	03.02.
- - - - -	04.01.
National Holiday	05.02.
Driving Dodoma - Iringa	06.01.
Visit at Danida & Maji Workshops	07.02.
Visit at Image Group Scheme	
Visit at Danida & Maji Workshops	08.02.
Driving Iringa - Mbeya	09.02.
Meeting with Danida and CCKK Maintenance Engineers	10.02.
Meeting with District Water Engineer	
Driving Mbeya - Iringa	11.02.
Iringa	12.02.
Driving Iringa - Songea	13.02.
Meeting with district Water Engineer	
Visit at Maji & Danida Workshop	
Visit at Vocational Training Centre	14.02.
Visit at Peramiho Mission	15.02.
Driving Songea - Iringa	Sunday 16.02.
Iringa - Meeting with CCKK representative	17.02.



Driving - Iringa - Mikumi	18.02.
Driving Mikumi - Dar Es Salaam	19.02.
Visit at Saruji Training Institute	20.02.
Visit at Vocational Training Centre Changombe, Dar Es Salaam	21.02.
Dar Es Salaam	Week-end 22.-23.02.
Visit at Water Resources Institute	
Visit at Ardhi Institute	24.02.
Final Meeting with Danida Steering Unit	25.02.
Dar Es Salaam	26.02.
Departure Dar Es Salaam	27.02.
Arrival Copenhagen	28.02.



PERSONS CONTACTED

Danida Mission: Mr. J. Lerborg	Attache
Danida Steering Unit: Mr. M. Liebst Mr. Fl. Henriksen Mr. T. Kuijlen	Project Coordinator Senior Technical Adviser Water Engineer
Ministry of Labour & Manpower Mr. M.H. Manyanga Mr. A. Athumani	Director Deputy Director
Vocational Training Centre Changombe, Dar Es Salaam Mr. J. Ellegård Mr. S. Albertsen Mr. L. Hald	Danida - -
Saruji Training Institute Waso Hill, Dar Es Salaam Mr. B. Rasmussen Mr. J. Timm	Project Coordinator Senior Technical Instructor
Water Resources Institute Dar Es Salaam Mr. Ola Olanders Mrs. B. Sandberg	Civil Engineer - -
Ardhi Institute DSM Mr. Fl. Nedergård	Project Coordinator
Vocational Training Centre, Dodoma Mr. H.C. Makanyaga Mr. J. Andersen Mr. G. Lundberg Mr. R. Van Loon	Principal Project Coordinator Senior Instructor Head of Electrical Dept.
Iringa Region Mr. S. Rwakatare Mr. E. Itumbili Mr. H. Egerrup Mr. P. Hansen Mr. K. Nielsen Mr. L. Dahl Mr. M. Kirkegaard	Regional Water Engineer Assistant Executive Engineer CCKK Representative CCKK Mechanical Engineer CCKK Implementation Engineer Village Participation Coordinator Danish Volunteer Service
Several Technicians	



Mbeya Region

Mr. M.O. Ngalisoni
Mr. Samson Babala
Mr. C. Lwakiromba
Mr. A. Nzunda
Mr. Wilson Masao
Mr. F. Sørensen
Mr. L. McCarry
Mr. P. Schmidt

Regional Water Engineer
Counterpart Engineer
Counterpart Engineer
Auto Electrician
Auto Mechanic
CCKK Mechanical Engineer
CCKK Implementation Engineer
Danish Volunteer Service

Ruvuma Region

Mr. A. Msilanga
Mr. A. Lyimo
Mr. B. Chayayi
Mr. S. Winther
Mr. S. Salobir
Mr. U.M. Steven
Brother Arthur
Brother Edgar
Brother Udo
Brother Polycarp
Brother Albert

Ass. Regional Water Engineer
Civil Engineer RWE
-
CCKK Implementation Engineer
CCKK Mechanical Engineer
Principal VTC Songea
Peramiho - Butchery
- Tailor workshop
- Mechanic. workshop
Printer Workshop
Carpentry Workshop





